

COAL AGE

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Problems of the Coal-Mining Industry

R. DAWSON HALL
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Our Case Like the Farmer's

CROP shortages and Government assistance have demoralized the farmers, as coal shortages, strikes and railroad inabilities with consequent high prices have demoralized the coal industry. It is difficult to tell how many years it will take to put either of the industries properly on their feet, so much have they suffered from over-expansion and the consequent excessive competition. If the coal men could combine in times of high prices to keep the price of coal down and to see that the ultimate consumer gets the benefit of that fact there would be less speculation, less consumer ownership of coal properties, an important cause of over development, and the industry would be on a surer footing.

Example of the Powder Companies

OPERATORS have convinced themselves quite generally that their business is done when they have produced the coal. It is the consumer's business, they say, to learn how to burn it. Of course, there are exceptions. After all there are different kinds of coal, and if one has only one kind to sell it pays to help the buyer to get good results. It helps to hold trade. If one has many kinds it is profitable to see that the consumer gets the kind that suits him and that gives him best value; it is well to see that he burns it economically. That promotes satisfaction and holds a customer.

But when a rival like oil is met, the coal men can get together to promote the common end. The menace is best overborne by making the consumer thrive so well burning coal that he will want no other fuel. The Kansas coal men are striving to achieve some such co-operation and some of the coal men elsewhere are endeavoring to create what they are pleased after the popular manner to term an institute. Whatever it is named it will have the same end in view.

Powder companies are setting the coal men a good example. They, individually, are trying to enable the operator to get lump coal with minimum risk to life, limb and property. Their function is to sell powder, but they believe it is also their duty to help the consumer to use it effectively. They even try to make him use less of it. They advocate open spaces in shotholes and rock dust instead of heavy, tight shots. Not by any means wholly unused to selling service the operators of coal mines can nevertheless learn a lesson from the powder manufacturer. In fact it is the genius of the hour to sell service and not merely a product.

Mr. Lewis, Keep Your Seat

NOBODY seems to be training to run against John Lewis next December for the presidency of the United Mine Workers. We hope nobody will. Mr.

Lewis is a good man for the job and he ought to stick to it, for if ever in history the union miners of this country needed a strong, sound leader, it is now. It is going to take a mighty good man to hold the organization together when it becomes necessary for that organization to take the backward step in wages as it has done in West Kentucky. Lewis will come as near to holding it together as anybody and operators in the strong union fields ought to be glad of that. It is distinctly to their interest that the United Mine Workers remain a representative unit with which to deal. There would be chaos indeed in the coal industry were there no such unit. Let us hope the union will not break, for the system of checks and balances which exists between unionism and non-unionism in coal is a healthy though oftentimes painful thing for the industry.

In a way it is unfortunate that President Lewis, facing the future that he faced before Jacksonville, waved his lion's mane so belligerently when he said he would never take a backward step in the matter of wages. Fortunately, however, a good politician can say a great many pompous and important things before election which are easily forgotten afterward. Mr. Lewis may have this comforting truth yet to learn. In past years he has not been a suave, wily politician. He has been a bludgeon swinger and a good one. His has been a victor's march. He has strewn his course with ultimatums delivered in the well known "loud stentorian tone." It remains to be proven that he is diplomat enough to accept for his men a wage that the coal industry can afford to pay. But he is a good man and we have hopes.

Shall Gas Be Made At the Mines?

THOUGH such a redoubtable authority as G. S. Brewer, the assistant fuel engineer of the U. S. Bureau of Mines, answers "No," to the question "Should Buffalo's gas be made at the coal mines?" the industry cannot but feel that the suggestion has not been and will not be definitely and finally shelved, especially where market and mine are closer to each other than is the case at Buffalo. It seems such a reasonable proposition that one is prone to doubt the negative testimony of experts.

It must be remembered that Buffalo is a long way from the coal fields, one hundred and twenty-five miles, and that distance adds to the difficulty. One company in Illinois is convinced that it does not pay to distribute more than fifty miles and decided to continue to operate two gas plants rather than concentrate on a single plant because that distance would be exceeded in that event. In that case the maximum pressure was about thirty pounds absolute. The Buffalo plan proposes to increase that to three hundred and seventy pounds.

However, it will be necessary to confront the facts, and these are that almost all the coal fields except the

anthracite region are obliged to compete with natural gas. Consequently the transmission of artificial gas through long distances seems almost inevitable if the gas is to reach a market not already monopolized by natural gas. If gas producing 1,000 British thermal units has rarely been transmitted long distances, there seems to be some valid reasons why artificial gas producing 537 British thermal units should find such transmission expensive especially in further view of the fact that natural gas being normally under high pressure requires less compression to make its delivery through pipes feasible. Leakage and the short life of wells perhaps account for hesitancy in building long gas lines but welding now makes leakage negligible even under high pressures and a line is being built from Shreveport to Beaumont, a distance of 210 miles.

According to G. S. Brewer, the authority mentioned, an investment of nearly two million dollars would be necessary if gas is to be transmitted to Buffalo through pipes from the nearest point in the coal field which is in the neighborhood of Reynoldsville, Pa. This investment *should* afford a profit of six per cent or not less than one hundred and twenty thousand dollars per annum, whereas, according to Mr. Brewer it cannot be figured to save more than sixty-six thousand. Such a prospect of meager profit would not find many takers.

However, looking at the figures contained in the article on p. 951 of this issue it will be seen that no consideration has been given to the storage of gas which would involve a considerable expenditure, perhaps \$300,000 if the manufacture were centered in Buffalo. The pipe line proposed would hold 518,375 cu.ft. at 370 lb. pressure or between twelve and thirteen million cubic feet figured at atmospheric pressure. This is an item not to be overlooked. It would iron out daily peaks quite satisfactorily. It must be remembered, however, that with twice that quantity being used per day in the winter it would not enable the plant at the mines to store in any one month enough gas to reduce perceptibly the needed production in another, nor would it make it feasible to reduce the diameter of the pipe. The pipe would serve merely as a gasometer. It would not function in any larger capacity, and speaking without careful inquiry, it might be found not as successful as a gasometer in meeting abnormal peaks.

Other advantages of a pipe line are that the coal would be carbonized where land is cheaper and where labor should be also. However, the disadvantage would be considerable in case of a strike or in case the area being mined should become exhausted. If pipes are to be used for the main transmission it would not do to have to haul coal to the plant by railroad and thus have a large portion of that expense the elimination of which was sought when the piping system was installed.

What Has Happened to Our Coal Dust?

NOTING the prevalence of explosions, ascribed as they usually are to coal dust, one begins to wonder what subtle change has taken place in the composition and condition of a substance that in early days was believed to be harmless and now is rightly regarded to be a chief cause of disaster.

The change is probably not so much in the dust as in other factors in explosions. True the dust is likely to be drier. We supply more air per man, we have

more men in the mines, and this air dries the dust. Our mines are deeper and therefore likely to be drier and a trifle warmer, the latter development being so slight that it only inconsiderably affects the dryness of the dust and therefore its explosibility. We are mining more extensively in dry, semi-arid and arid regions and in consequence the mines are drier. That doubtless had much to do with the Castlegate explosion and with the disasters at Dawson, N. M. The Western and Middle-Western coals also which are newer have more dangerous dust than Eastern mines.

Still with all these reasons arising from the nature of the dust why are we suddenly confronted with an increase in disasters such as we have had? There have been no incursions of ignorant foreigners on whom we used complacently to place the blame. Our mining population is more stable and experienced than in the past. There can be but two explanations—the mine-run scale of wages and more gas.

Now that the men are paid for all the coal they mine, large and small, they let powder do the work. They make more slack and dust and they use larger and thus more dangerous shots. But after all the principal cause of most of the recent explosions is gas. A small gas explosion occurs and is propagated by dust. The trouble is that our mines are gradually getting deeper. They possibly always had a little gas.

Without means to detect it no one knew it was there. Perhaps in some favorable part of the mine it might be induced even to burn. In mines that were closed up the methane emission was so slow and the formation of carbon dioxide so rapid that the mines when opened and not ventilated could be explored with a naked light without an explosion, though not without danger. The mines were said to be non-gaseous. Since then the operators, superintendents and foremen operating these mines have extended them under deeper cover.

Gradually they have become more gaseous but the progress has been slow toward recognizing the mines as really gassy operations. In fact accidents, larger or smaller, have dictated every move—first firebosses, then mixed lights, later abolition of smoking, then searches for matches, later permissible explosives, then a closed-light mine and yet again permissible machinery. There are more gradations than those mentioned and some of the changes were rather in the growth of discipline than in methods.

When men from non-gaseous mines went to gaseous they were mostly culpably lax. A superintendent, in a mine now operated by the Old Ben Coal Corporation, today one of the best conducted operations in the country, not so many years ago called attention of an editor of this paper to a blower proceeding from a shothole and before he could be restrained took a match and lighted it. It took some minutes of vigorous fanning with his cap to put the lambent flame out. Such superintendents are learning every day, but at what needless cost?

Times have changed conditions so much that we are wondering if all coal mines should not be rated as gaseous mines even at the risk of being a little unfair to some shallow, cropy operations. The disasters must cease. The industry must soon determine that the rank and file of mines must toe a common line. They are rapidly getting to be gaseous operations and that fact must be realized.

Twin-Rope Skip Hoist Works Well

Small Ropes Reduce First Cost of Installation, a Relatively Light Hoist Running at High Speed Thus Being Made Available—Two-Car Rotary Dump Cuts Down Payroll

BY ANDREWS ALLEN AND H. F. HEBLEY

Chicago, Ill.



USING two ropes of comparatively small diameter for hoisting coal skips containing eight to eleven tons of coal each is a somewhat novel practice that has fully justified its adoption at the recently completed Thermal No. 4 mine of the Donk Bros. Coal & Coke Co., in Madison County, Illinois. By this means, it has been possible to decrease the size of the drum upon which the ropes are wound and to use an engine smaller, though of higher speed, than would have been necessary had the ordinary single rope been installed. This decreased the initial cost of the installation. It constitutes, however, only one of several more or less radical departures from conventional practice adopted at this operation.

To some, interest in this plant may center in the layout of the shaft bottom, which was built around a two-car rotary dump that requires two less men for its operation than does the average cage-equipped mine of equal output. Others would be interested in the steel and concrete headframe, or in some of the various tippie refinements, such as the single-arm drive near the center of each shaker screen leaf and the triangular chutes that spread the coal from the screens evenly upon the picking tables.

This mine was designed to hoist 6,000 tons of coal per day, its capacity now amounting to between 3,000 and 3,500 tons. It was opened a few years ago and has been hoisting coal through the 2,000-ton-capacity auxiliary shaft since early in 1921. The first unit of this plant, including the first section of the power house, the various surface buildings and the auxiliary shaft tippie fitted with shaker screens designed to prepare lump and egg coal, also the overturning cages, were described in *Coal Age*, in the issue of June 9,

1921. During the summer of 1922 the company decided to complete the plant. This work was begun in September of that year and the first coal was hoisted from the main shaft and prepared at the main tippie on Oct. 11, 1923. The mine workings are still in process of development.

FURNISHES POWER TO ANOTHER COAL MINE

When the company decided that its entire plant at its No. 2 mine near Maryville, with the sole exception of the hoist, should be electrified by current from the power plant at No. 4 mine, the original design of that plant had to be modified slightly. The original selection of power units had to be changed and an outdoor step-up transfer station with a power line extending to No. 2 works had to be added.

In describing the plant at No. 4 mine, it will be advisable to consider it under four divisions: First, the tippie and preparation plant; second, the hoisting equipment; third, the bottom dumping station and, fourth, the power plant. The last division, however, will be considered separately in another article, which will appear next week.

The main tippie is designed for treating 6,000 tons of coal per day, preparing it in five sizes—6-in. lump; 6x3-in. egg; 3x2-in. No. 1 nut; 2x1½-in. No. 2 nut and 1½-in. slack, as well as various combinations of these sizes, all of which may be loaded direct. All sizes except slack will be carried into the cars over picking tables and loading booms. The clear height under the tippie is such that locomotives can pass under the tippie on any track. Degradation of prepared coal is avoided by the use of long loading booms which carefully lower the tippie product into the cars.

The arrangement of the yard necessitated the location of the through track for handling empties midway between the egg and No. 1 nut tracks. As the loco-

NOTE—The illustration used as a headpiece was made from a photograph taken from a point down track and shows not only the tippie structure but the "wine-glass" refuse bin and crusher shed. Both tippie and shed span six railroad tracks.

tive can pass under the tippie, this arrangement has the further advantage that this track may be used for shunting as well as a runaround. The yard is built on a gravity grade, however, so that locomotives need not be used as shunters except when cars are stiff.

It was necessary, therefore, to place six tracks under the tippie. Advantage was taken of this fact, however, to obtain a dump hopper of ample size and an inclined apron feeder that permitted appreciably lowering the dumping point.

In this tippie the main screens have the exceptional width of 10 ft., and operate at a speed of 100 r.p.m. The upper deck is provided with 3-in. perforations at the upper end and 6-in. lip screens for egg coal. The lower deck has 2-in. perforations. The 2-in. slack is carried on an apron conveyor to the upper end of a single-leaf secondary shaker, having a 1x6-in. lip screen, designed to give the equivalent of 1½-in. round perforations. At the upper end of this screen a gate can be opened when it is desired to make 2-in. slack. This may be done without running the shaker.

Design of the main screen is such that when making 2-in. or 3-in. lump, this coal can be divided equally between the lump and egg picking tables. This avoids the usual difficulty of having the egg boom idle and the lump boom greatly overloaded.

SINGLE-ARM DRIVES AFFORD EXCELLENT RESULTS

The main shaker is operated by a crank drive through single connecting rods or arms extending to the approximate center of each of the screen leaves. The double crank is mounted in quarter boxes and driven by a band flywheel from a 35-hp. motor. This drive is placed above the screen where it is out of the dirt and is easily accessible for attention and adjustment.

Single-arm drives attached to the screen near the center of each leaf have many obvious advantages over the usual double-arm type. No trouble is experienced in keeping the single-arm drive in adjustment, and consequently there is small tendency to side motion. Drives of this kind have exactly half the average number of working parts to be kept in repair that double-arm drives contain.

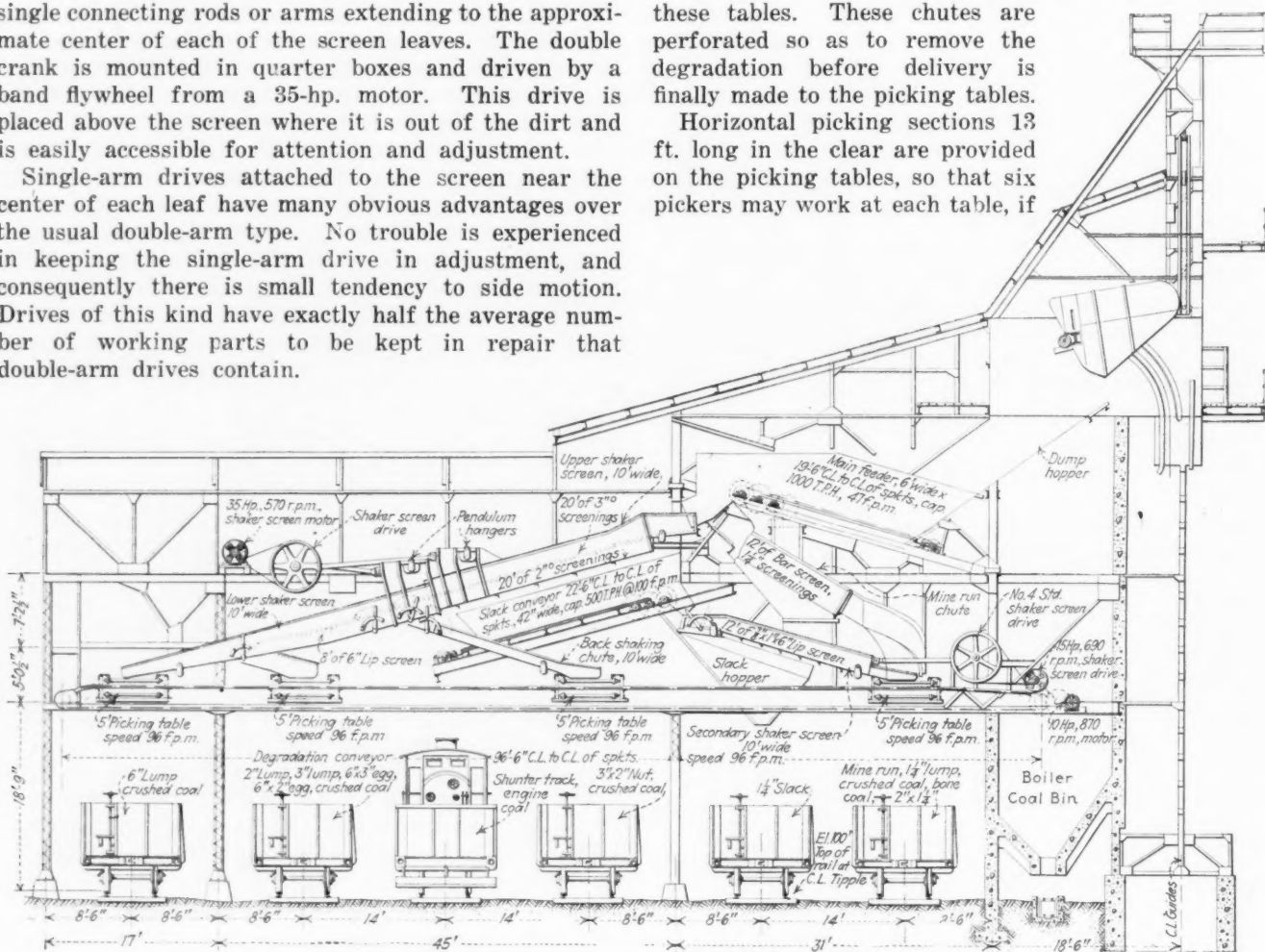
The crank drive has afforded extremely gratifying results thus far as compared with the time-honored eccentric. The diameter of the crank journal is only one-third that of an eccentric of equal throw. This means that the speed of rubbing within the journal is decreased in a similar proportion. Heating troubles are thus practically eliminated and nearly two-thirds of the power ordinarily consumed in eccentric friction is saved.

In this installation, the drive of the auxiliary shaker is also a single crank, similar in character to that of the main drive. Cranks of this type, fitted with single driving arms and with wedge adjustment of the boxes at either end, have regularly operated for many years without trouble, and no repairs are necessary except adjustment and occasional reabbtting.

Both the main and secondary screens are suspended on short drop-shaft hangers. These are 9 in. long and are journaled on the sides of the screens and on the main trusses of the shaker structure. The result of this suspension has been a smoothly-operating screen with just enough vertical movement to assist in keeping the perforations clear. This motion also has a certain sorting action on the coal, so that the smaller pieces naturally seek the bottom of the pile where they are easily screened out.

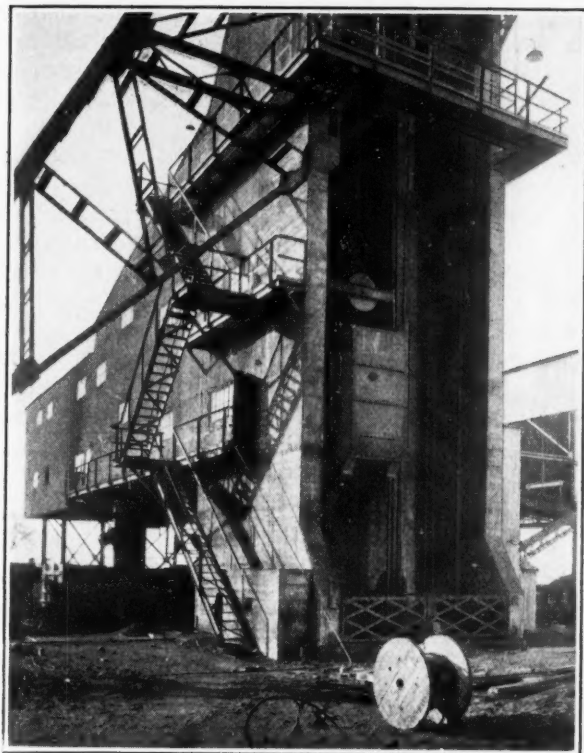
Discharge of the coal from the screen to the picking table is made over specially designed triangular chutes, which afford an even distribution of the material on these tables. These chutes are perforated so as to remove the degradation before delivery is finally made to the picking tables.

Horizontal picking sections 13 ft. long in the clear are provided on the picking tables, so that six pickers may work at each table, if



Cross-Section of the Thermal No. 4 Tippie, Donk Bros. Coal & Coke Co.

By using an elevating feeder serving the shaking screens the point of skip discharge was made lower than otherwise would have been possible. The pendulum-hung screens of unusual width are actuated through single arms or connecting rods from a crank drive placed above them.



Skip Hoisted in Tipple Structure

The twin ropes and the equalizing sheave in the skip bail can be clearly seen. The concrete on three sides of the skip compartments protects the tipple from the shaft gases yet allows ready access to guides, buntions and the like.

necessary. In practice, four are employed on each lump table together with two pick men who break up the lumps of coal and gob so that the slate and bone may be dropped through a 6x6-in. grating into the gob conveyor, the coal being returned to the tables. The egg and nut tables usually employ four pickers each.

The gob conveyor consists of two parallel troughs, into which the burnable and unburnable pickings are sorted. The burnable material is taken by this conveyor to a bin adjacent to the shaft where it is crushed for use in the boiler house. The unburnable gob is delivered into a bin of the "wine-glass" type so situated that its contents may be discharged into a car standing on the No. 2 nut track below the end of the No. 2 nut loading boom.

The picking shed is entirely inclosed and provided with a line of windows across the end of the picking space. Consequently this portion of the building may be heated, and the pickers are well protected from the weather. The loading booms, however, extend into the open and are raised and lowered by counter-balanced, worm-gear hoists suspended from a steel-frame bridge situated down track but near the ends of the booms. The hoists raising and lowering these booms, however, are housed in a totally inclosed gallery.

INDIVIDUAL MOTORS DRIVE VARIOUS UNITS

All the various tipple units are fitted with individual motor drives equipped with helical gears and flexible couplings. The motors are operated from push-button control boards located in the picking shed over the engine track. Here the tippelman can overlook the operation of the entire tipple. Cars on the tracks are controlled by car retarders, and the booms are raised and lowered by the trimmer.

Down yard from the end of the loading booms is another structure spanning the tipple tracks. In this is installed a ring crusher mounted on skids. This machine may be moved into position opposite the end of the loading booms, the product from which may be crushed and loaded directly into a car. A small hopper is also mounted above the engine track so that a locomotive may be coaled with egg fuel which is held in this hopper for this purpose.

The tipple construction is heavy and rigid throughout. The shaker trusses are framed into the main structure instead of being carried on a separate support as is the usual practice. There is no sway to this structure and the vibration when the screens are running is barely perceptible. The tower above the shaft is of reinforced concrete up to a point 17 ft. above the rail. Above this elevation it is of structural steel, concreted on three sides, leaving the front entirely open thus affording ready access to the skip, guides, buntions, etc., and at the same time protecting the steel and the interior of the tipple from shaft gases and consequent deterioration.

The shaft is provided with overturning skips pivoted at the bottom and provided with latches to hold them in a vertical position within the shaft. They are operated by long-radius dumping angles at the top so as to afford an easy dumping cycle and diminish the drop given the coal during discharge. The dumping side of the skip is inclined at an angle of 30 deg. to the vertical, so that the skip has to overturn only 105 deg. in order to secure a 45 deg. angle for the flow of the coal. This inclination has been found sufficient in practice, and experience has shown that no excessive breakage of coal is incurred when a skip is operated in this manner.

The hoisting equipment includes a double-rope system which, so far as is known, is new in operations



Shaker Screens in Action

These screens are double-decked, but the details of greatest interest are the supports and the drive. Pendulum hangers support these screens, the latter being driven by single arms or connecting rods. The screen openings used are both circular and slotted.

of this kind. A 1-in. hoisting rope is employed, both ends of which are fastened to the drum. The two ropes then pass over a double-grooved sheave and around an equalizing sheave 3 ft. in diameter attached to the skip bail. This affords an excellent rope connection at the skip with an easily accessible arrangement for adjustment at the drum. The small rope diameter makes it possible to employ a cylindro-conical drum 5 to 7 ft. in diameter and a 24x42-in. hoisting engine operating at a fair speed.

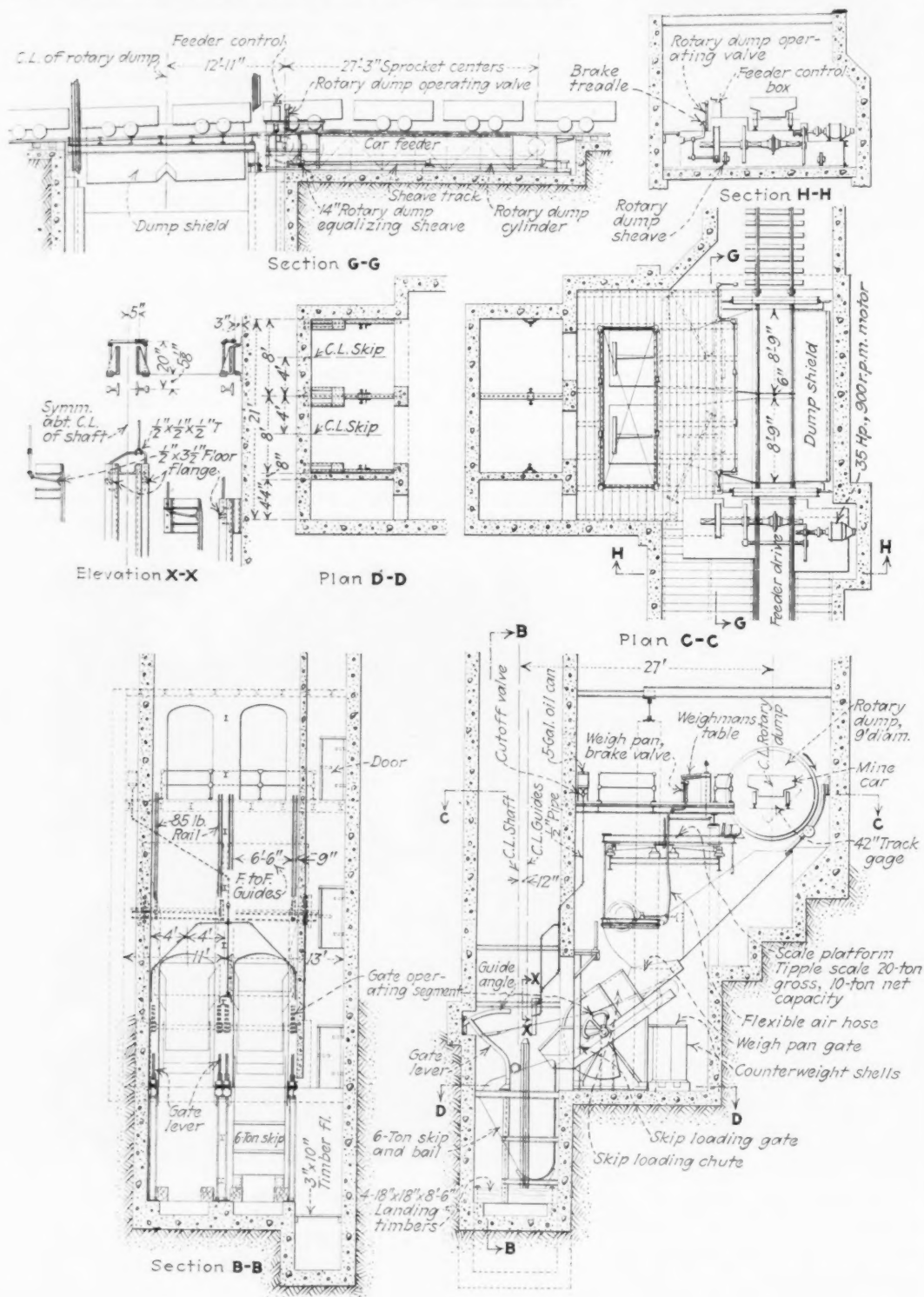
A single rope of equal strength would have been not less than 1½ in. in diameter and would have required a drum at least 8 ft. in diameter. This would have necessitated the installation of an engine of much slower speed and longer stroke entailing a considerably

increased first cost for the hoist. The double-rope system has afforded entire satisfaction in practice, and there is no reason why a similar system cannot be adopted at many operations especially those employing skip hoisting where speed is slow and the load heavy.

The skips have a nominal capacity of 320 cu.ft., or about 8 tons of coal. They may, however, be surcharged without spill to a capacity of 10 or 11 tons. Each skip with its bail weighs a little less than 7 tons complete.

Exhaust steam from the hoisting engine is utilized for power purposes being passed through a pair of regenerators and a mixed-pressure turbine. These will be described in greater detail in the article on the power plant to appear later.

The mine is designed to use solid-end cars and



Shaft Bottom of Thermal Mine No. 4

Although the coal is dumped from the weighpan before the skip has landed, the gate in the skip chute is opened by the skip itself so that there is no spillage into the skip sump. As the skip starts to rise, also, this gate is closed so that it is unnecessary for the skip to remain standing until the last dribble of coal has run into it. This arrangement saves much time. The rotary dump handles two cars at a time. The skips will hold three cars of coal each but so far the regular loading has been only two cars or about 6 tons per skip. In the morning a single car is dumped in one weigh pan. At the next dumping two cars are discharged, one in each pan. The weigh pan with two carloads is discharged to the skip leaving one pan with no coal and the other with a carload. When the next two cars are dumped the pan with two carloads is discharged to the skip leaving the other pan ready to be discharged after the next dumping.



Pickers at Work on the Picking Tables

Four pickers and two pickmen on the lump table and four pickers on the egg table complete the usual complement of coal cleaners. This portion of the building is enclosed and may be heated. The loading booms, however, extend out into the weather.

overturning self-dumping cages at the auxiliary shaft. A two-car rotary dump is placed at the foot of the main shaft. The skips will hold three cars of coal each but so far have been regularly operated on a two-car basis. This gives a total load of about 6 tons per skip. The hoisting cycle at the present time actually consumes about 25 sec. This includes all the operations between hoists, about 8 sec. being consumed in loading the skip at the bottom. Cars are handled through the rotary dump in trips without uncoupling, the car hitchings employed embodying a swiveling spring drawhead at one end of the car and a single link between cars.

Cars are moved and spotted in the dump by means of a chain feeder about three car-lengths long. This is provided with lugs which engage lugs on the cars. Two sets of lugs are provided on the chain, one engaging the cars and one coming between them. Thus

should one set miss the car, the next set would pick up and carry the trip along without interruption.

This car feeder is operated by a 35-hp. motor fitted with a solenoid brake. A foot brake also is applied to the headshaft as an auxiliary. The grade on the bottom is 6 per cent against the loads; that on the feeder is $1\frac{1}{2}$ per cent adverse, while the grade on the dump is 2 per cent with the loads, this inclination being extended for some distance below the dump in order to string out the cars and put tension on all of the couplings so that the pins will not fall out during the dumping process. Below this 2 per cent section the grade is gradually flattened out to level, so that trips when cut off at the dump run easily and uniformly to the end of the empty track.

Trips are brought in from the mine by the main haulage motor and left on the main bottom. The locomotive then proceeds by way of a crosscut to the empty bottom where it picks up its trip of empties and returns to the mine. The trip of loads left on the bottom is taken by a shunter locomotive which operates on a track beside the single-track bottom. This moves the trip forward until its first car may be coupled onto the string of cars on the feeder.

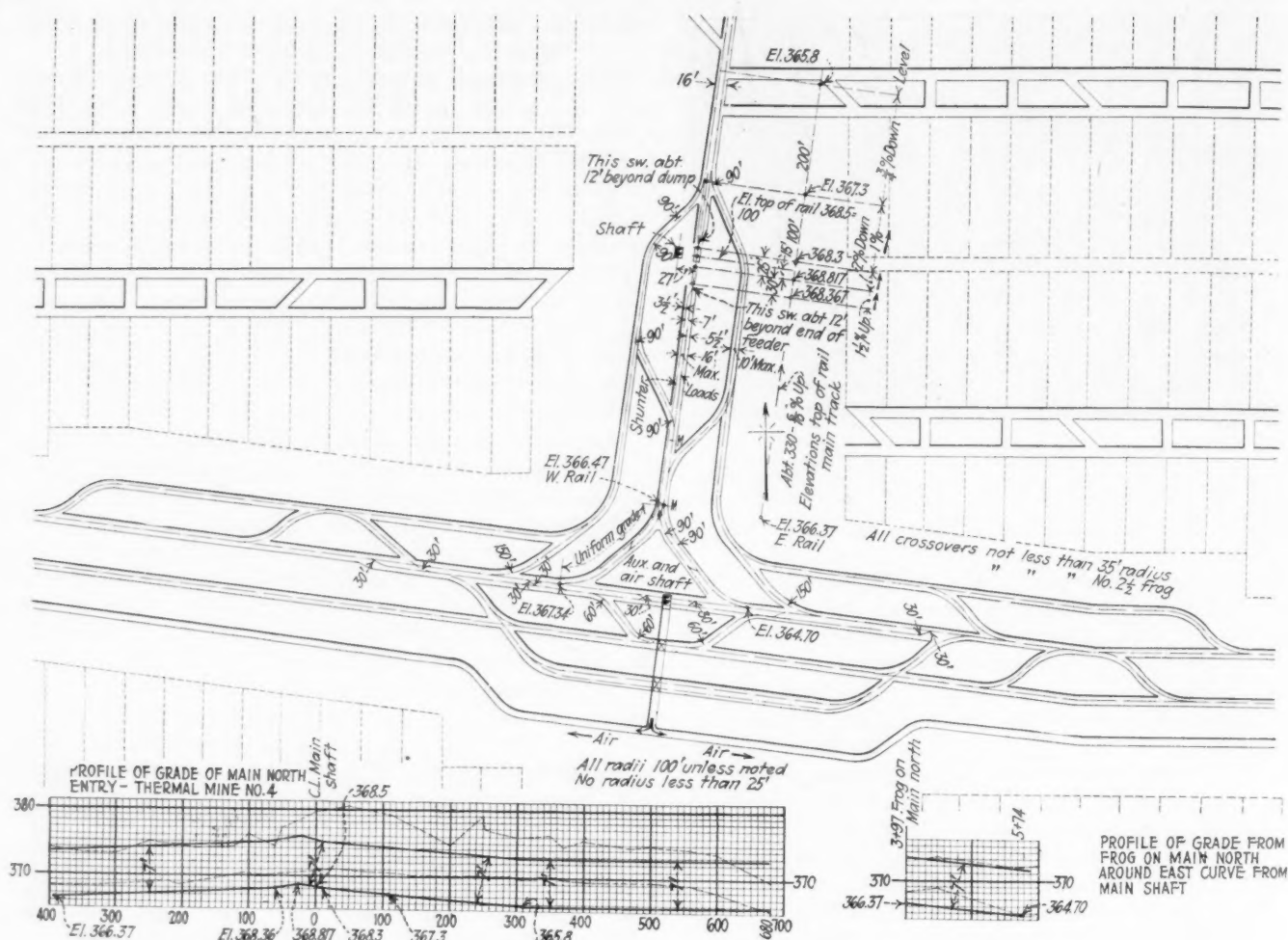
In this manner a continuous supply of cars is provided for the dump and feeder, and the whole string, sometimes as many as sixty cars at a time, is easily handled by the feeder. The trips are cut off just below the dump and a stop is provided so that the couplings may be slack when pins are to be pulled.

The car dump handles two cars at a time and is actuated by two air cylinders set horizontally in the shaft bottom alongside the feeder frame and under the floor. From the dump, coal from each car goes into a separate weigh pan. The second carload goes in on top of the first and is weighed with a double-beam scale. This scale is arranged for the ultimate installation of



Rotary Dump

This dump is air operated and controlled by one man, two cars being discharged at a time. It is unnecessary to uncouple the cars from the trip in order to dump their contents. The number of men employed at the bottom is thus appreciably reduced yet a steady stream of cars may be fed to the dump. Swivel couplings are of course used between cars which are of the solid-body type.



Bottom Layout of Thermal No. 4 Mine

Coal may be hoisted from either the main or auxiliary shafts, and the mine has been largely developed from this latter opening. Under ordinary circumstances, however, all hoisting will be done at the main shaft which is equipped to raise 6,000 tons per day. Careful planning was exercised in laying out this bottom.

either a weightograph or a self-recording device of some kind.

In ordinary manipulation, a single car is dumped in a weigh pan. On the next operation of the dump, two cars are discharged. This gives two carloads in one weigh pan and one in the other. From this time on, two cars are discharged at a time, and two loads of coal are ready for each skip as it lands. When three cars are handled in a skip the first car can either be dumped against the gate in the chute, or three carloads may be discharged successively into the pan and weighed cumulatively in the same manner as two cars. The weigh pan is of the ordinary gravity-operated type, with an air plunger to lift the brake weight.

When operating at maximum capacity, the weigh pan will be dumped as soon as the descending skip has passed the dumper level. The coal will thus reach the skip just as it lands. To prevent coal going into the sump and to avoid the necessity of holding the skip until the last dribble of coal has passed into it, a pivoted and counterweighted undercut gate has been placed at the lower end of the chute from the weigh pan to the skip. This gate is opened by the skip itself during the last 6 ft. of its descent. It is closed by a counterweight when the skip rises. This gate is provided with a discharge spout that projects over the side of the skip in the loading position and prevents spillage of coal between the chute and skip. At present the skip remains at the bottom only 8 sec. This time

interval, however, may be decreased as the operation of hoisting is speeded up.

All operations of handling coal on the bottom are performed by four men, a weighman, a check puller, a dumper who handles the feeder and the rotary dump, and a man on the shunter locomotive. In a cage-hoisting mine the weighman and check puller would be located in the tipple, leaving two men properly assigned to the bottom as against at least the four that would be needed for uncoupling, coupling and caging in a mine even approximately the size of this one if it were hoisting by means of cages.

It is anticipated also at this mine that the maintenance expense incurred in keeping cars in proper shape will be reduced at least 50 per cent on account of the solid-end construction and the easy manner in which these cars are handled at this operation.

The Donk Bros. Coal & Coke Co., owners of this property, is the largest company operating in the Standard District—or Belleville Field—of Illinois. This firm has now been in business for sixty years during which time it has controlled many coal properties. In addition to Thermal No. 4, it at present operates Maryville No. 2, with a capacity of 4,000 tons a day, and a coal washery with a capacity of 1,000 tons. The company also controls the St. Louis, Troy and Eastern R.R., on which coal is transported to the St. Louis market. Within this latter city and in East St. Louis, Ill., it operates fourteen retail coal yards.

Old Men More Subject Than Younger to Accidents

Habit Promotes Carelessness—Declining Activity Possible Cause of Accidents—Older Men Probably Succumb to Accidental Injuries—Men Who Have Had One Accident Liable to Have Another

BY THOMAS T. READ AND W. W. ADAMS*

IS THE new employee or the old and experienced one the more likely to suffer from accidents? is a question frequently asked at safety meetings. It is commonly thought that the new employee is the more liable to injury, because of his unfamiliarity with the hazards of his new job. On the other hand, it is often claimed that the man's very unfamiliarity impels him to use greater caution, which should compensate or more than compensate for his inexperience.

Again, it is argued that the old employee will avoid hazards through habit; but others claim that habit will more often cause a man to ignore hazards that would attract the attention of a less familiar workman who is conscious of his danger.

As a simple illustration of the latter argument, compare the two ways in which a small child and a grown person will button their clothes. The grown person, by force of habit gives no attention to what he is doing and fails to notice a needle left sticking in the buttonhole. On the other hand a child performing the same operation with conscious attention to each button and hole is more likely to see the needle and remove it before being hurt.

Doubtless there is truth in all these arguments, but their relative weight cannot now be determined, because we do not have sufficient statistical data from which to argue. Evidence supporting the view that accident frequently increases with the age of the individual and, presumably also, with his experience and length of service, is furnished by certain statistical data relating to fatalities among coal miners in England and Wales.

Statistics covering three three-year periods, 1890-92, 1900-02, and 1910-12, taken from the report of the Registrar General, Great Britain, show that accidental deaths are not only more frequent among the older miners employed in the mines, but fatalities are likewise more frequent among the older men engaged in other industries than mining. The latter fact is rather more surprising than the former, because older men, being less active and presumably, leading a more quiet mode of life, might be expected to meet with fewer hazards, considering all occupations. It is probable, however, that this factor is more than counterbalanced by the lesser degree of alertness of the older men.

Apparently a younger man, though engaging in

sports and activities making him liable to occasional injury, is yet able to escape under circumstances that might result in accident to an older man. The alertness of the younger and more active man seemingly more than compensates for the less active and therefore less hazardous occupation of the older class of workmen.

This view is further strengthened by the higher fatality rates among the older employees in mines.

The figures compiled from the reports of the Registrar General show that older miners almost invariably meet with a larger number of fatal accidents than younger men. The fatality rate for men about sixty-five years of age, for example, may be seven times as high as that for men under twenty-five years of age. In Table I are given the fatality rates, per thousand men,

in each respective age group indicated in the left-hand column. The rates are further classified as mine accidents and accidents in other industries.

One point not shown by these figures is the character of mining work performed by men of different ages. It is possible that many of the younger men are new employees, and hence are not assigned to the more hazardous jobs in the mines, until they have acquired the necessary experience to perform the work with a reasonable degree of safety.

Another point not considered is the lower bodily resistance of the older men, which may cause them to succumb to an injury from which a younger man might quickly recover. In the absence of evidence on these two points, however, the record indicates that, in the coal mines of England and Wales at least, fatality rates are higher among the older and presumably, more experienced employees.

Another factor that has attracted little attention as yet is what may properly be called the "personal accident hazard." This is recognized, to some extent at least, in the axiomatic phrase, "the best accident pre-

BORN UNDER AN UNLUCKY STAR

Though constellations and their groupings have nothing to do with the lives of men, the old belief is that there are individuals subject to unusual personal hazards who find danger even in relatively safe occupations. They are not necessarily reckless but may be temperamentally unable to scent danger or slow to avoid it. Most of us as years increase and strength declines fall under the influence of the unlucky star. Some men, for instance, are notoriously unsafe in the saddle and some become so with increasing years.

Table I—Fatality Rates of Miners in Great Britain By Age Groups

Age Group	Mine Fatalities			Fatalities of Others		
	1890-92	1900-02	1910-12	1890-92	1900-02	1910-12
15-20.....	1.5	1.1	1.1	..	0.1	0.2
20-25.....	1.3	1.0	1.1	0.2	0.2	0.2
25-35.....	1.6	1.1	1.2	0.2	0.1	0.2
35-45.....	1.8	1.4	1.3	0.3	0.2	0.3
45-55.....	2.4	1.7	1.4	0.5	0.4	0.5
55-65.....	2.4	2.9	1.6	0.7	0.8	0.7
65 and upward	3.0	2.6	.8	1.1	1.3	1.5

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*Acting assistant to the director and statistician, respectively.

ventive is a careful man." It is probable, however, that this phrase implies, in the minds of most people, that any man who wishes can put himself in that category and so eliminate most of his accident hazards. But such reasoning is faulty. A deaf or blind man has a personal accident hazard owing to his disability, and no amount of care on his part will serve to eliminate though it will lessen the degree of hazard. There is good reason to suppose the existence of other personal characteristics that, though less evident than blindness or deafness, still constitute true accident hazards.

The only statistical studies that throw any light on this matter are those made by Karl Marbe, professor in the University of Würzburg, in an effort to support his hypothesis that a man's liability to accident can be measured by the number of accidents he has already experienced. The studies are based on the records of an insurance company that insured commissioned and non-commissioned officers in the German army against accidents of any kind.

Three thousand individuals, taken at random from among those who had been insured for ten years or more, were selected and their individual accident records plotted and compared. These were divided into three groups as follows: (a) Persons who had had no accidents in the first five years of their insurance period, (b) Those who had had but one accident in this period, (c) Those who had had several accidents in the same period. The average number of accidents for each group for the second five years was then computed, and is as in Table II.

Table II—Average Number of Accidents in Second Five-Year Period

(Of men grouped by accidents in first five-year period)

Group A (No accident in first five-year period).....	0.52
Group B (One accident in first five-year period).....	0.91
Group C (More than one accident in first five-year period)...	1.34

In other words, a man who has had an accident in his first five-year period is nearly twice as likely as a man who had no accident in the first five years to have an accident in his second five-year period. A man who had more than one accident in the first five years is more than 2½ times as liable to accident in the second five years as the man who had no accident in the first five years.

This computation was checked by dividing the same individuals into two groups: (a) Those who had no accidents in the first two years of the insurance period and (b) Those who had one or more accidents in the first two years. Computing the average accident rate during the last two years of the insurance period for each of these groups, they compare as in Table III.

Table III—Average Number of Accidents in Last Two Years of Insurance Period

(Of men grouped by accidents in first two years)

Group A (No accidents in first two-year period).....	0.24
Group B (One or more accidents in the first two-year period)...	0.42

In other words, a man who has had an accident in the first two years of his insurance period is, approximately, twice as likely to have an accident in the last two years as is a man who had no accident in the first two years of the same period.

The question immediately arises, however, as to whether the persons injured in the first two-year and five-year periods were not engaged in occupations

involving a greater hazard than those in which the persons who had no accidents in that period were engaged. For the purpose of checking this the individuals were divided into three classes of hazards; namely, the first class included bureau employees engaged in office work, the second those employees on foreign duties, the third class embracing those engaged in especially dangerous duties. Analyzing each of these classes it was again found that the persons who had accidents in the first two or five years of their insurance period were more liable to accident in the second or last two or five years of the insurance period.

The possibility of hazard outside of the occupation of the individual, such as habitually engaging in certain forms of sport, was also investigated statistically, and this method also confirmed the first general conclusion that people who have had accidents are more liable to have more.

The conclusion Professor Marbe draws from his study is whenever a man has an accident his insurance premium against subsequent accidents should be increased. A more important conclusion with respect to accident prevention, however, is the obvious necessity for increased care on the part of those who have had accidents. It is perhaps too generally supposed that an accident automatically makes a person more careful; but it is at least doubtful whether this is true. It seems safe to conclude from the statistical studies that when a man has had an accident it is, on the average, a notice to him that he needs to take unusual care to prevent future accidents.

British Also Taking Stock of Resources

GREAT BRITAIN is re-acquiring apparently that interest in industry that marked the end of the eighteenth century and the beginning of the nineteenth. With the Archbishop of Canterbury sinking the first pick into the downcast shaft of the Betteshanger Colliery and the Prince of Wales writing a foreword to the book on "Fuel," recently contributed to the *Recourses of the Empire Series*, we see a revival of that interest in industry which made an England of an earlier day known as a "Nation of Shopkeepers." Our Canadian friends likewise have held celebrations as significant at the opening of briquetting works. For the volume on "Fuel" about to be reviewed not only the Prince of Wales but Sir Eric Geddes and Sir Robert A. Hadfield have written introductions. All of which open up on a book with 83 pp. on coal, lignite and peat, 15 on carbonization, synthetic processes and carbonaceous wastes, 67 on petroleum and 6 on power alcohol.

The first section on coal, lignite and peat is by Professor Henry Louis, a well recognized authority in the coal industry. However we fear an American reader will be somewhat dissatisfied because the analyses given are relatively few and not detailed as to origin though they are given much space. In justification it must be acknowledged that the British government has provided no such storehouses of information relative to analyses as has been afforded by U. S. Bureau of Mines.

In a country like Great Britain where the coals vary in volatile matter with depth and igneous intrusions if more analyses were given it would be easier to ascertain the range of carbonization in any one district. The book is issued by Ernest Benn, Ltd., of 8 Bouverie St., London, England, measures 7½x10½ in. and contains 208 pp.

Technical Sessions, Illinois Mining Institute

Tracy Describes the Twin Agents of Death—Open Door and Open Light — McCoy Tells How He and His High-School Boys Have Developed Telephony — Farnham Relates How India Mines Coal

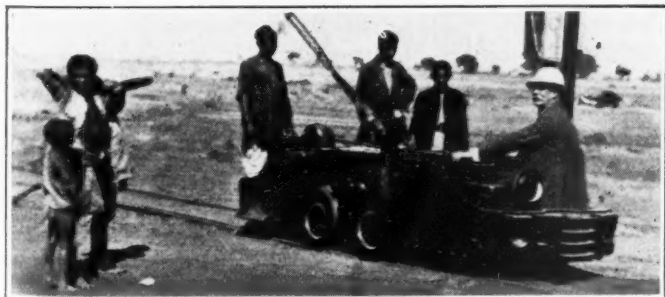
THE OPEN light and the open door are the "twins" which endanger coal mining most seriously, said Mr. Tracy in an address on mine explosion causes and remedies before the Illinois Mining Institute. He attacked black powder as having killed 857 men in seventy-one United States explosions. Permissibles, properly used, he holds would greatly reduce accidents. The "twins" of the open miners' light and the carelessly opened door which shortcircuits mine air are most dangerous between Saturday at 6 p.m. and the following Monday morning at 8, and therefore should be guarded against during those hours most scrupulously. Bureau of Mines statistics show they have caused the deaths of 2,300 men.

The open door, so often left open by plain carelessness, is one reason why no mine is safe. Mr. Tracy said the fact that an ordinary safety lamp may not detect gas is no proof that the mine cannot have a gas explosion. Such a lamp cannot detect gas in a quantity less than one per cent. But even 0.03 per cent of gas, if allowed to accumulate during a period such as a week-end, especially by short circuiting of air, rolls up in sufficient volume to make trouble. There have been explosions by gas in mines which normally generate only that small volume.

He advocated the use of permissible explosives, more comprehensive state laws that would require the service of mine examiners with territories small enough to be carefully covered, and greater care by miners, fewer doors to give opportunity for accidental short circuits of air, the use of methane detectors, not lamps, in gas tests and the maintenance at every mine of auxiliary power for ventilating fans. He spoke favorably of the new code of safety accepted by the operators of Utah, following the Castle Gate disaster, which takes effect July 1.

President D. D. Wilcox, remarked that Utah is not likely to live up to the new stringent code very long. The mutual effect of the explosion at Castle Gate is about like that caused by the Cherry mine disaster in Illinois in 1908. In that year Illinois adopted some impracticable regulations, many of which are not enforced.

NOTE—The meeting was described in last week's issue, p. 917.



First Locomotive at an Indian Coal Mine

The Goodman company delivered this electric trinket to the Tata Iron & Steel Co. for use in its Jamadoba colliery in the Jheria field, about 180 miles northwest of Calcutta only eighteen months ago. It helped mark the transition in Indian mining from the primitive to the modern. The transition is slow but is getting a good start in the mines of one or two companies.



Indian Type of Loading Machinery

The common practice in India is to hoist coal out whenever labor is available and dump it on the ground until orders are received for shipment. When these come, the usual method of transporting coal from pile to car is by women like these, with baskets big enough to hold about 75 lb.

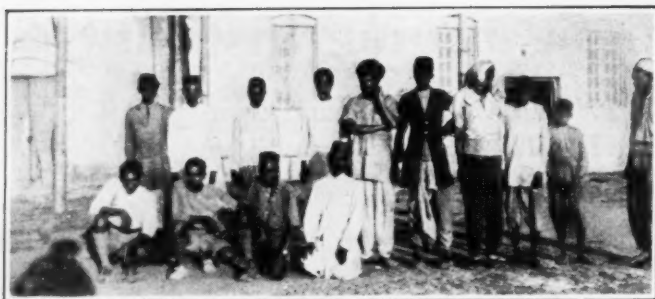
A discussion of the relative merits of black powder and permissibles followed in which Thomas English raised the point: Why does the Bureau of Mines advise the use of no more than 1½ lb. of permissible per hole, answering it by saying a greater quantity would generate too much carbon monoxide.

The story of the first real success in radio communication between the surface and the inside of a coal mine by ground conduction was told the Institute by A. B. McCall of the Springfield high school faculty and consulting engineer for the Bureau of Mines. He told the story of how he and the radio club of the high school had interested themselves in the problem and how they got the results at the Woodside mine near Springfield that have attracted the attention not only of the state department of mines and minerals but of the Bureau. A descriptive article on their work will appear in *Coal Age*.

SINK ELECTRODES BELOW GROUND WATER

The method they have developed depends upon vertical transmission of voice currents between a pair of electrodes sunk 15 or 20 ft. into the surface over a mine and another pair in the mine, each pair connected to a 39½-lb. telephonic set. The ground is almost constant and forms an excellent conductor unless thick deposits of metal ores or a heavy volume of water intervenes. These conditions will seldom be met in coal and were not encountered at the Woodside mine. There, the surface electrodes were sunk below the ground-water zone and easy communication established with a set underground. It was determined that the line of the underground electrodes should parallel that of the electrodes on the surface but that audibility can be secured with variations up to an angle of 60 deg.

The practical application of the method to assure communication between the top and entombed but not incapacitated miners caught by explosion or fire, would require the maintenance of such sets in refuge chambers in various sections of a mine. Pairs of electrodes would then be maintained on the surface to which



High-Grade Technical Men at an Indian Mine

This is the type of workmen that has to be depended upon to do much of the development of Indian coal mining from the primitive to the modern. The gentleman in the center wearing a black turban is the chief electrician at one colliery. However the equipment is nearly foolproof and is successfully operated by the natives after a little training.

a portable set duplicating those in the mine could be attached at any moment during an emergency.

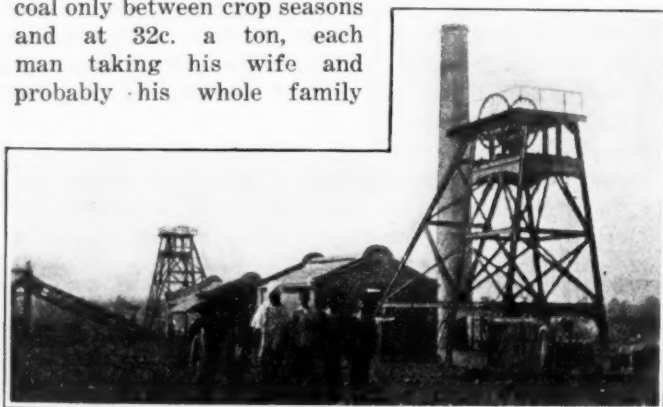
NO WIRES OR RAILS USED IN CONDUCTING LINE

Previous radio communication with underground places have depended largely upon the presence of wires, rails or other metallic conductors, Mr. McCoy said, even though breaks might have existed in such conducting lines. This new system depends upon ground conduction alone and can be operated at depths limited by the distance between the electrodes of each surface pair. Mr. McCoy and his high-school boys learned that the operating depth can be up to five times the distance between electrodes. The experimenters hope to carry their work farther and prove the value of other radio circuits which will further simplify the already simple one that has been used successfully at Woodside mine.

Coal mining in India proved a most interesting and somewhat amusing process to the Institute as pictured in word and slide by S. W. Farnham of the Goodman Mfg. Co. While a storm raged outside sweeping chairs off the deck and eventually driving the boat to tie up for an hour, Mr. Farnham spoke of the immense deposits of India, especially of the Jharia and Raniganj fields where many beds exist, some of them 20 ft. or more thick, the mining methods in which have been most primitive.

WIFE AND FAMILY HELP HUSBAND UNDERGROUND

In the Jharia field the thickness of the coal is no less than 200 ft. so that a big mine could operate for years under a surface of not more than 40 acres. The miners are of the agricultural caste and mine and load coal only between crop seasons and at 32c. a ton, each man taking his wife and probably his whole family



Modern Coal-Mine Top Works in India

The plants at two mines are shown in this picture. They are close together because the coal deposits under some of the land in the Jharia and Raniganj fields often total 200 ft. in several workable seams. Thus a tract of 40 acres often has enough coal in it to justify the erection of an expensive and permanent top plant. The men in the foreground are part of the electrical gang of the mine.

down into the mine with him while he is at work. Ventilation such as American miners get would not be endured by the Indian who fears catching cold from fresh air underground. The result is mine atmospheres are usually foul but entirely satisfactory to the Indian while he gets out his 1½ tons a day which is pushed out of the mine by the women in 1,200-lb. "tubs" or larry cars at a haulage cost to the mine owner of five cents a ton. Most of the coal from both slope, shaft or strip mines is dumped on the surface as fast as the operator can get men to mine it. It is loaded onto railroad cars by women with baskets whenever there is a shipment to be made.

In underground mining the best practice calls for the driving of 12-ft. entries dividing the coal into blocks which are removed on a retreating basis so that extraction often is high. Usual practice at those mines which are near rivers is to flush sand into the worked-out areas thus supporting the roof behind the active operations.

But coal mining in India recently has been turning to more modern and bigger-scale methods, he said. The first electric locomotive was put to work in the fields only 18 months ago. Skip hoists are being installed in a few mines and the haulage equipment is steadily getting larger.

Removed Ventilating Tubes at Gartshore And Explosion Resulted

IN GREAT BRITAIN the reports on mine explosions come long after the event, perhaps because the inquiry is quite thorough but more often for reasons that extenuate rather than explain. The report on the Gartshore explosion has just come to hand though it occurred as long ago as July 28 of last year. The official inquiry was held at Glasgow, Jan. 23-24, and twenty-two witnesses were called. It appears that at this colliery, which is in Dumbartonshire, Scotland, a 6x8 ft. roadway had been driven for use as a sump from the bottom of a shaft 558 ft. deep. The roadway was 590 ft. long and crossed three pitching seams of coal. It was driven quite crookedly, so much so that it almost returned on itself. It was ventilated by a pipe of 17-in. diameter which carried air from the return current of the mine to the face of the roadway, about 3,000 cu.ft. of air being thus delivered. Naked lights were used, but a flame safety lamp was kept burning near the roof at the face.

The ventilating pipes were removed from the face outwards as soon as steel girders and brick walls had been erected to support the roof and sides. Walls were being erected near the mouth of the roadway when an explosion occurred killing eight men and injuring two. Safety lamps, a cap with an acetylene lamp attached, a cap with a "naked-light" lamp attached and a can containing calcium carbide were taken from the sump-road 20 ft. from the mouth. The use of ventilating pipes in Great Britain, the danger of withdrawing them before a positive air circuit is provided for their replacement and the deliberate way the British follow up even minor accidents are interesting features in the record.

IN SPITE of heartbreaking obstacles in the path of underground loading, there's Joy among the loading machine men.

Sleeve Bearing Keeps Oil From Spattering Motor

Oil and Dust Carrying Bearing Lubricant Causes Electrical Equipment Failures—Bearing Excludes Dirt and Prevents Oil Leakage

BY R. PRUGER*

LEAKAGE of oil from the housings of bearings is rather a common source of trouble not only in the case of electric motors but wherever machinery is used. However, as long as no damage results from such leakage, a little attention on the part of the operator will take care of any escaping oil and keep the installation neat and clean.

With electrical machinery, however, the trouble is far more serious, the escaping oil easily reaches the windings or commutator and finally causes a short circuit or other serious damage to the machine. This may interrupt operation and entail expense for repairs. It will also result in considerable waste of lubricant, which is quite an item where a large number of motors are used. Fig. 1 shows how leakage occurs.

In order to remedy such defects, a "sealed-sleeve" bearing has been designed. If a perfect air seal can be maintained, that is, if the air cannot get in, it is obvious that the oil cannot get out. Preventing air currents from passing through the housing should, therefore, eliminate the leakage.

HOUSING MADE ALMOST WHOLLY AIRTIGHT

Though it is not possible to maintain an absolutely air-sealed housing, yet the design can be made such that it will approach this condition, and when further supplemented by mechanical devices, for the purpose of taking care of what little oil might still get out, a housing can be made which permits operating at high speeds despite the resultant air suction set up by adjacent ventilating blades and other moving parts.

This has been accomplished in the design as shown in Fig. 2. It may be noted that the bearing shell itself was not changed but remained standard, thus being interchangeable with bearings formerly used. The housing, however, is of a new type.

The cover, ordinarily found at the outside of the

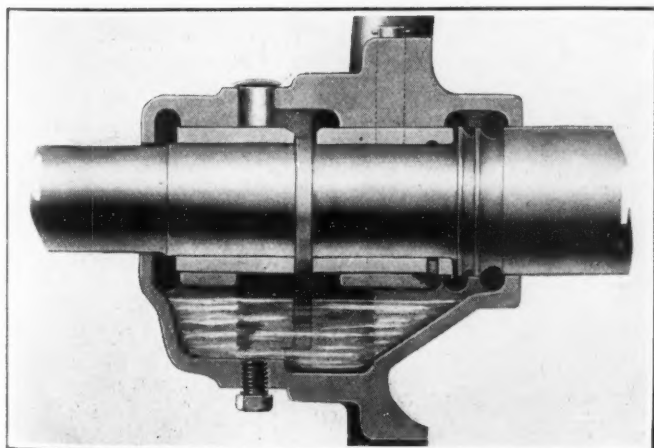


Fig. 1—Motor Bearing of Conventional Design

Note the openings in the housing through which air and dust can enter the bearing, mix with the oil and be carried into the motor windings.

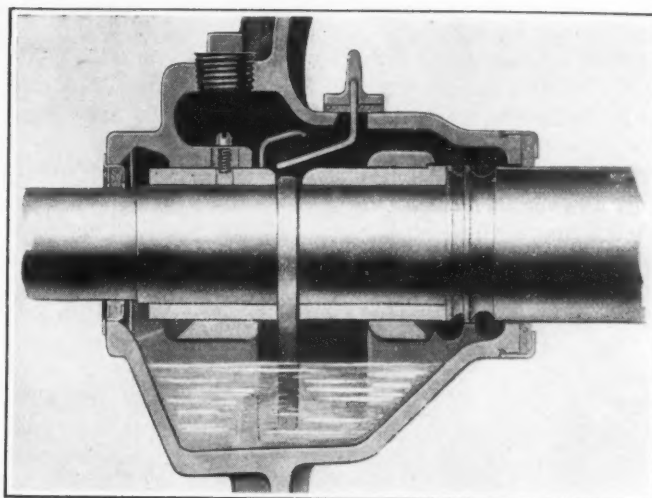


Fig. 2—Motor Bearing with Sealed Sleeve

This illustration shows how effectively this bearing is sealed against the entrance of air or dust and prevents the leakage of oil or oily vapor into the motor.

housing, that closes the opening through which the oil ring is admitted, was placed on the inside of the housing. This cover need not be removed, except for changing the bearing. This new location has the advantage that it permits the cover itself to be carefully bolted down, fully compressing the packing under it. As it is thus practically out of reach on the assembled motor, no one is likely to attempt to remove it.

For the purpose of inspecting the oil ring, a large pipe plug has been placed on the outside end of the housing. This plug can be removed easily and put back into place, air tight, with equal ease.

The dowel pin, which ordinarily keeps the bearing from turning and which is inserted from the outside wall of the housing, has been placed on the inside of the housing directly accessible through the pipe plug hole. Any sucking action has thus been rendered harmless, as it will be within the housing itself.

SHOULD NOT BECOME EVEN OIL SOAKED

The drain plug usually found at the lower part of the housing has been omitted. Such a plug certainly should not leak oil but that is not enough, it should not even become oil-coated. The effect of air currents passing over wetted surfaces and carrying oil vapors into the machine has been found quite an objectionable feature. For this reason every effort has been made to omit wherever possible all tapped holes, as it is found that pipe plugs below the oil level will leak. Even if plugged correctly at first, frequent unscrewing and oftentimes careless replacing will cause a small leak. This results in large wetted surfaces over which the intruding air passes. Experience has shown that a sealed housing which does not permit the air to enter will also exclude dirt and dust. With grinding of bearings, due to dirt in the oil, eliminated, the life of the bearing and the periods between changing of oil may be lengthened considerably.

Inasmuch as the shaft of an electric motor has a certain amount of end play, which at times may become quite pronounced, the shaft, when moving toward the inside of the housing becomes wetted by the oil vapors in the housing. On its outward movement this wetted surface is exposed, and at high speeds, small particles of oil are thrown off. As in the previous case, air currents pick up these particles and carry them into the

*Motor Engineering Department, Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa.

motor, where they are deposited upon the windings. It has been shown that on motors running at 3,600 r.p.m., this feature resulted in covering windings and adjacent parts with a film of oil within a few days' operation.

In order to eliminate this defect, a conical collar, forming a seal and acting as an oil thrower, has been placed upon the shaft on the inside of the housing of 3,600 r.p.m. machines. This collar is slotted to permit its being held on the shaft by reason of its own spring or clamping action, which permits automatic adjustment. This collar runs in a stationary cone-shaped piece of the same cone angle, leaving a small running clearance between the two conical surfaces. Any oil vapor reaching this clearance space is held there by capillarity when the machine is at rest and is quickly pulled toward the inside of the housing by centrifugal force when the motor is in operation and is thrown off by the lip of the revolving cone.

The oil thus thrown off is deposited on the inside of housing walls, where it is free to run downward. For this reason, the stationary cone is provided with a groove which guides the oil back into the oil well.

A similar action takes place on the inside end of the housing. Here, however, the shaft is provided with oil throwers of standard design, permitting the use of standard rotors the same as on the old standard machines. Again, the same action of small particles of oil being thrown off when shaft end play takes place is found. Such small quantities of oil as are thrown off at that point are caught by the outer chamber of the housing cap and rendered harmless. The soft felt washer placed on the inside and the soft felt lining in the outer chamber absorb this small quantity of oil and lead it back by capillarity into the oil well.

Soft felt washers at either end of the housing are primarily for the purpose of making the housing dust-proof and not to prevent oil leakage. In very dirty places, a double chamber cap, such as shown on the inside end of the housing, may also be provided at the outside end. Very fine dirt or grit deposited upon the shaft may find its way into the housing once it is worked under the felt by the end play. However, when the cap is provided with a double chamber, any dust

deposited upon the shaft can reach only up to the cap, and the shaft surface next to the felt washer and within this outer chamber is thus protected from any deposit. This, however, is found necessary only in very dirty places where much fine hard grit is found suspended in the air.

CIRCUMVENTING SUCTION OF FAN BLADES

As the action of fan blades and blowers driven at high speeds by the motor sets up quite a vacuum next to the inside end of the housing, it is obvious that this vacuum is communicated to the space within the housing itself, as it is impossible to seal the housing absolutely on account of the shaft passing through. As a result of the housing being divided into several separate chambers by the bearing supports, unbalanced air pressure may result in case the oil level is high enough to close the lower cored openings. It is for this reason that a cored channel which establishes communication between the chambers, thus balancing the air pressure, is provided at the top part of the housing, for the oil level next to the inside end of the housing may be raised if a vacuum greater than that found elsewhere in the housing exists.

At high speed, the action of the oil ring frequently sets up a surging of the oil, forcing it in the direction of rotation of the ring, which action may cause a slight overflowing at the overflow plug. This may be prevented by means of baffles which are cast into the housing and form a quiet level in the chamber next to the overflow plug.

It will be observed that where soft felt washers, such as are shown at the outside end of housing, are used, the metal cap has an inside bore diameter of at least $\frac{1}{4}$ in. larger than the shaft diameter, which is for the purpose of lending resilience to the soft felt. If the felt were compressed at a point close to the shaft, it would in a short time wear out, becoming glazed and hardened, causing it to burn and char. Soft felt of a good quality, if left free to expand, will act somewhat like a brush, and wear almost indefinitely, accomplishing its function as dust protector.

It is sometimes found, that machine operators fill the housing by removing the plug at the top. This is in-

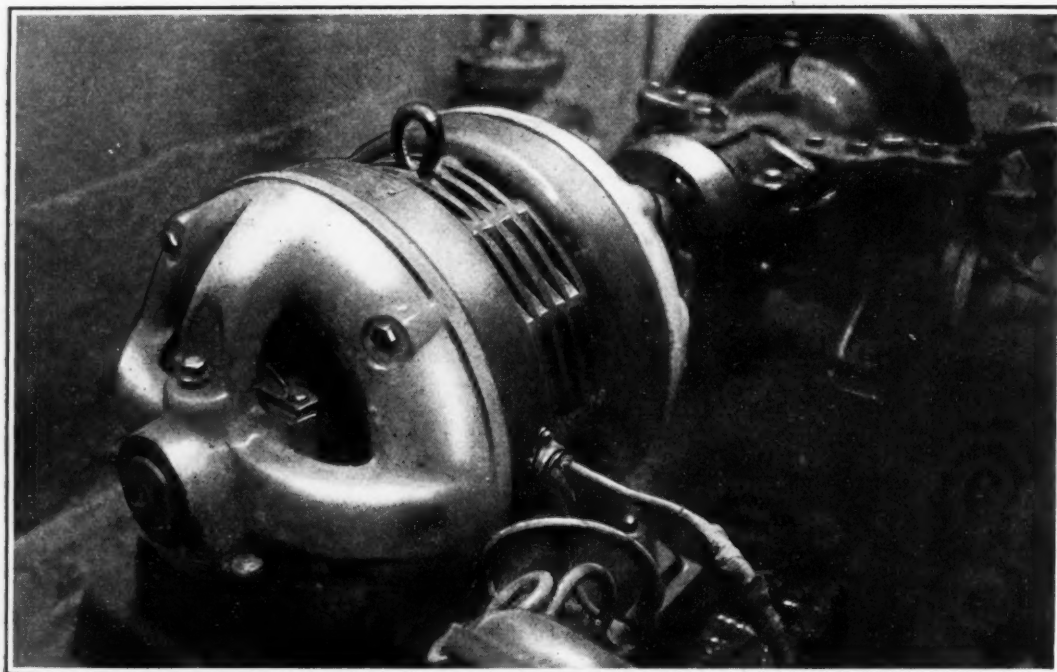
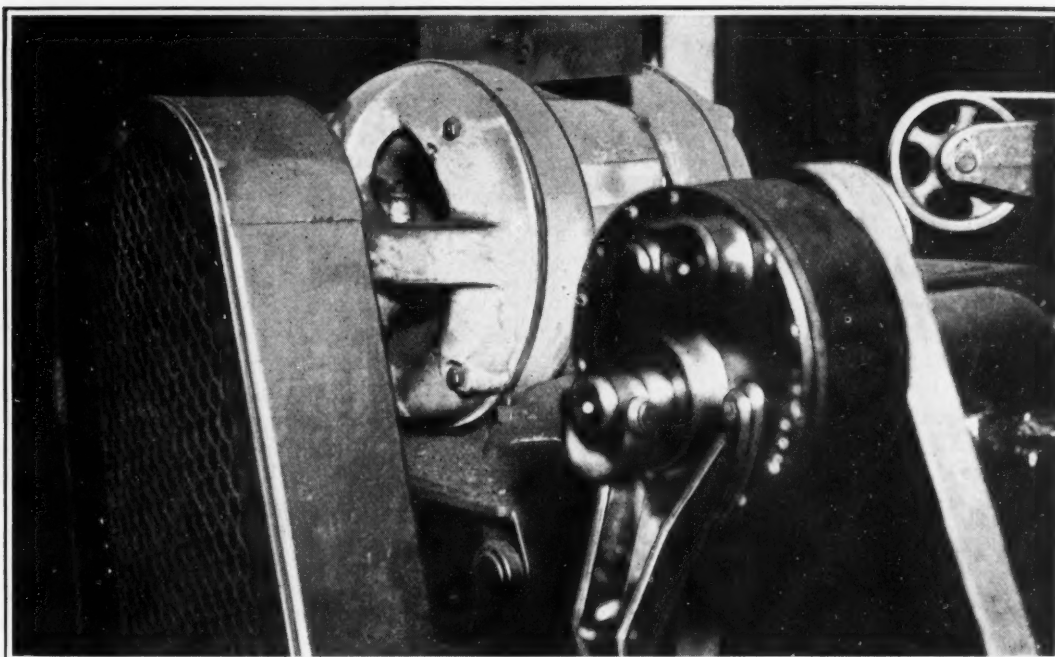


Fig. 3 — New Type Bearing

Although this bearing has been in service for many months, there is no leakage of oil into the motor, the shaft being actually rusty.

Fig. 4 — Dust-Covered Motor

This squirrel-cage motor has been operating continuously in severe machine-tool service for nearly a year with no oil being added to the bearings. The dust covering the bearing is perfectly dry and can be blown off easily.



correct and unless the overflow plug is watched closely when filling, the oil level may rise so rapidly that it may also overflow into the motor through the housing bore. The soft felt washer located at the face of the housing prevents this overflowing effectively for a long enough time that the oil can find its level.

FREEDOM FROM DIRT PROLONGS LIFE OF OIL

This type of bearing requires practically no attention, and it has been found that it is best to postpone oiling until the need for it becomes apparent. This may be due to the natural breaking down of the oil or to dirt which may eventually become mixed with the lubricant.

It is always advisable to renew the oil soon after a new motor has been put into service to make sure of

getting rid of core sand. Though the motor manufacturer removes as much of this as possible, some of the recesses in the housing may contain hard deposits which, when softened by the oil, become loosened. A test sample, drawn out of the oil reservoir by means of a small pump, would soon disclose this fact.

It has been proved that the sealed-sleeve bearing requires less attention than is now common with electric motor operation, and in fact an occasional inspection is sufficient to convince the operator that the proper oil level is being maintained and that no refilling is required. Operating conditions and quality of lubricant used will easily set the period required for oil renewals, which may be from three to six months or even longer. A good grade of light machine oil is preferred for use with the leak-proof sleeve bearing.

How to Ground Electrical Mining Machinery

With Bonded Track or Pipe Beware Lest Changes Destroy Ground — Interconnect Pipes Electrically — With Gathering Pumps Do Not Rely on Pipe

BY CHARLES M. MEANS
Consulting Engineer, Pittsburgh, Pa.

THE IMPORTANCE of grounding the frames, bed-plates and all metallic non-current carrying parts of stationary electrical equipment is fully evidenced by the fact that all safety rules require it. It is doubly important, when we are dealing with underground equipment because of the character of the surroundings. Close adherence to the rules for grounding is strictly necessary for all power equipment, regardless of the voltage of the circuit to which such equipment is connected.

The object of grounding is to maintain all metallic non-current carrying parts at zero potential or at the same potential as the surrounding earth. In order to create this condition such parts must be in intimate contact with the earth.

This naturally brings us to the problem of what can be considered an adequate ground connection and how to obtain it in a mine. The conditions existing in coal mines vary between wide limits and no definite rules for grounding can be laid down that will fit every case.

Where a well-bonded track or a relatively long pipe line laid on the bottom is available, the problem is not difficult of solution. But it is important to know that the track is not likely to be disturbed or the pipe line broken near the point where the ground is attached. This, however, is a problem of maintenance, for the permanency of the ground is dependent on inspection and upkeep.

When equipment is located remote from a bonded track or a pipe line, the problem may involve difficulties. In many mines the roof and bottom may be quite dry and therefore act as an insulator. Under such conditions it will be difficult to secure an adequate ground; but in turn the hazard involved under such conditions is likely to be of less consequence than in wet places.

It should be the rule, nevertheless, to apply a good ground to all stationary equipment, no matter where located. It may be necessary to run the ground wire a long distance to obtain an adequate connection to the earth. Such a wire should be run on insulating supports and in no case be allowed to lie on the bottom

NOTE—Article entitled "The Grounding of Electrical Mining Machinery" delivered at meeting of West Virginia Coal Mining Institute, Elkins, W. Va., June 17-18.

along the entries, or in contact with the sides of roof.

The method of installing the ground connection is important. It should receive the same care as the line wires. The wire should be accessible and in plain view at all times to admit of ready inspection. Its size can be determined by local conditions but should never be smaller than No. 6.

GIVE GROUND CONNECTION SAME CARE AS FEEDERS

In underground substations great care should be taken to provide adequate ground connection. It is to the interest of safety to provide more than one ground connection from all equipment so located. The ground wire may be soldered, brazed or otherwise connected to the machine in lugs that are held by clamps, bolts or studs. The frames and bedplates of motors and generators, all supporting metallic frames on the switchboards or controlling devices, as well as the metallic covering of all cables, should be connected to the earth or grounded return.

Motors and controls used to operate permanently located pumps should be treated in the manner described for substations. In pump rooms, however, the difficulty of securing a permanent ground is somewhat lessened by the presence of pipe lines which can be used for the purpose—but the ground connection should include interconnection of all pipe lines, either through the ground wire or by permanently connecting the pipes.

Gathering pumps present a somewhat different problem, and each case must be handled as conditions warrant. In general it is safest to run an independent line to a permanent ground from the suction or discharge line. This practice eliminates the possibility of shock when disconnecting pipe lines and is imperative where wood or fiber water lines are used. In many cases, where the motor and control is mounted on the same base as the pump, the elements of safety will be met by eliminating the ground connection entirely.

BEWARE OF STOPS ON HEAVILY SANDED RAIL

Trolley locomotives come under the head of portable equipment and are under all ordinary circumstances in intimate contact with a bonded track which answers every purpose of a proper ground. Exceptions to this assumption arise when the locomotive stops on a heavily sanded rail or is run onto a section of track that is not bonded. Both of these exceptions are the result of operating conditions that should not be allowed to exist.

The storage-battery locomotive represents a type of electrical equipment that does not require a ground connection, as its electrical circuit is complete within itself and should be insulated from the frame.

With machines for mining, loading, drilling and conveying coal, an entirely different problem has to be met, and one that does not always find a practicable solution. The legal requirements of certain foreign countries demand the grounding of frames of mining machines, but that is not required in this country.

It is a fact that in certain mines a hazard is created by not grounding the frames, but in most mines very little if anything is to be gained, for a ground wire might be a source of danger. When we speak of mining machines, we naturally think of the shortwall type which is in general use. While cutting across the face or being dragged to or from the truck the frame is in intimate contact with the earth.

There may be exceptions to this case. The frame

may happen to be insulated from the bottom to such an extent that a man, in the event of a short circuit between the winding and the frame, might get a shock while standing on the floor of the mine. In dry places this usually is not a hazard, but it may be a source of danger in a wet mine.

A greater hazard can exist when the machine is loaded on a truck, as at this time it may be on a track that is insulated from the earth. Even there the value of a ground wire is questionable, as it would be better to bond the rails. With machines that cut coal while resting on a track and with loading machines and conveyors a condition arises similar to that when a short-wall mining machine rests on a truck. This also can be met by bonding the rails where necessary. Equipment fitted with caterpillar trucks is in sufficiently close contact with the earth to be considered properly grounded.

A somewhat different problem is involved in the use of portable electric drills, and it is considered advisable to use a cable having a separate conductor for grounding. Grounding is deemed necessary by the fact that the drill may not be in contact with the earth and may be actually in the hands of the operator.

SURGES MAKE ALTERNATING CURRENT DANGEROUS

Up to this time the voltage or character of current has not been mentioned inasmuch as all power circuits present a certain hazard due to their ability to produce a shock that may result fatally. The hazard varies with respect to the voltage as well as with the character of current. Of ordinary underground current direct current of 250 volts probably presents the least hazard and 440-volt alternating current the greatest. The hazard of shocks from direct current at a given voltage is less than from alternating current having the same voltage reading. The alternating-current voltage shown on a voltmeter is the mean voltage and not the maximum and that must be remembered whenever shocks are being considered.

Alternating current has the added danger that the voltage may be materially increased by surges on the transmission line, or contact with a high-potential circuit due to an accident at the transformer or switching equipment.

It will probably be in the interest of safety to have all underground alternating-current circuits used for operating three-phase mining machines and similar equipment connected "Y" with the middle point grounded. The cases of all transformers connected to circuits supplying power for the operation of underground equipment should be properly grounded with a wire independent of that used for the grounding of lightning arresters.

The lack of proper grounding of electrical equipment has been responsible in the past for a number of fatalities in the coal-mining industry and still continues to be an important hazard, but with our increasing knowledge of the value of grounding and the exercise of reasonable care, it is being materially reduced.

THE LONGWALL SYSTEM of coal mining is being extended in the Sydney Mines district, N. S., having been found suitable to conditions in the collieries. It is expected to be particularly advantageous in the operation of the Princess mine, where, owing to its adoption, no further development will be necessary for ten years. It is asserted that labor costs will be reduced and the output increased.

West Virginia Mining Institute Discusses Safety Measures at Elkins and Views Conveyor Mine

Classify Your Accidents as You Would Your Operating Costs—
Interchangeable Copper Fuses in a Locked Fuse Box Favored—Socket
Box on Rib at Each Room and Repair of Cables Outside Mine Advocated

STATISTICS were given and analyzed at what is said to be the best meeting ever held by the West Virginia Coal Mining Institute, at Elkins, June 17 and 18, which show that in Pennsylvania second mining is more hazardous than first mining but that the relative positions of these two operations in the scale of danger and safety can be exchanged by concentration methods of mining. It was made evident also that much remains to be decided as to the best methods of grounding electrical mining machinery. Blowout fuses, what they should be and where they should be installed to protect machines and the men who operate them, also were discussed. J. W. Paul, chief of the coal mining investigations conducted by the Bureau of Mines, remarked, "Wherever the engineering profession devotes itself to accident prevention, it accomplishes something." The problem rightly should be regarded as the engineer's.

Though Elkins is inaccessible from many parts of the state all regions were represented. Several men from Logan County were en route for 36 hours to join with more than 100 men who attended the meeting. The afternoon of the first day was devoted to papers and discussions, the evening to entertainment, and the following morning to an inspection trip.

FOREPOLING ROOF MAY DO MORE THAN CAUTION

Newell G. Alford, consulting mining engineer of Pittsburgh, in his paper on "Engineering and Accident Prevention," conveyed the need for better engineering methods and more extensive use of labor-saving machinery. His theory is that machines and mining methods that facilitate their use will allow the coal to be extracted before the roof (which is responsible for most accidents) begins to work and come down. He let tables and charts do his talking. His paper will appear in next week's issue.

There was little discussion of Mr. Alford's paper because the majority of the coal companies represented do not so classify the accidents that occur in their mines that such information can be properly correlated. Nevertheless he impressed the operators with the advantages that might be derived by such systematic classification in measuring the efficiency of methods. The moral of his paper is that good engineering, not only saves operating costs but lowers accident rates.

According to Dr. Rutledge, one company mined 2,225,000 tons of coal in 47 months without a single fatality. This record for safety came to an end by a death that was due to the carelessness of the man who was the victim of the accident. Someone in the audience attributed this record to education, particularly by extension courses promoted by the state. Robert Lambie defended West Virginia by saying that the Gay Coal & Coke Co., Logan County, has a better record.

An example of how good engineering makes mining

comparatively safe even under hazardous conditions was given by Dr. Rutledge, referring to the methods now being used to recover pillar, roof and bottom coal from old mines in the Big Vein seam on Georges Creek. He said that forepoling and careful timbering has made it possible to tunnel through old workings and reach this valuable coal.

A telegram from E. C. Jones, Glen White, W. Va., who was scheduled to read a paper on "Stray Currents," informed the institute that sickness in his family deterred him from attending the meeting. Charles M. Means, consulting engineer, of Pittsburgh, read a paper on "Grounding of Electrical Machinery," which appears in this issue.

ALTERNATING CURRENTS NOT RATED BY MAXIMA

Dr. Rutledge opened the discussion of Mr. Means' paper by telling of some of his early observations of alternating-current installations. He said for a number of years this kind of current gave much trouble. The legislators and the labor interests wanted to prohibit its use underground. Mine inspectors and electrical engineers disagreed as to the way in which alternating current should be handled.

In answer to a question relative to voltages of alternating-current underground circuits Mr. Means warned against the use of 440 volts. A voltmeter reading registers only the mean voltage, whereas the maximum voltage may be 800. William Jarvis mentioned the English method of grounding in which a third wire is carried from a junction box to the generator in case of a two-wire direct-current system, and a fourth wire is similarly carried where alternating current is used. Dr. Rutledge asked what precautions might be taken in a scheme of that kind to prevent incorrect plugging of the terminals. Mr. Jarvis suggested that a color for each wire or some mechanical scheme would make identification easy.

WAY TO AVOID INSERTION OF WIRE IN FUSE

The discussion turned to cable and cutting-machine fuses. Dr. Rutledge sees a means of eliminating the dangers of copper fuses by the use of a locked fuse box. A piece of equipment of this kind is now on the market. It is so arranged that each of six fuses will burn out successively before a replacement is necessary. Mr. Lambie believes in having a socket on the rib tapped from the trolley wire to keep men away from the wire in plugging-in. He recommends the use of a fuse in the cable in addition to one on the machine to which it conducts power. Mr. Kingsland of the Consolidation Coal Co. said that he has a padlocked fuse box on one of his storage-battery locomotives. It contains three fuses; when all of these are blown they are replaced by the mine electrician who is the sole possessor of a key for the lock. This same equipment could be used on cutting machines.

In Alberta, power cables are often repaired on the outside of the mine, remarked Dr. Rutledge. This practice insures a thorough job. He also mentioned the fact that insulated cable nips with enclosed fuses are being introduced in a few mines.

In response to President J. W. Reed, Fairmont, Mr. Means stated that shocks from an ungrounded alternating-current circuit would be prevented, of course, if all three wires were thoroughly insulated. But leakage almost invariably occurs giving the man who furnishes the path between the ground and the wire with which he comes in contact the full benefit of the difference of potential between them.

Asked whether transformers should be placed inside or outside mines Mr. Means replied that virtually there is no difference between the two locations except that the inside location presents a fire hazard because the oil is likely to ignite. Fireproof stations are necessary therefore. Mr. Chapman asked if a person touching a 220-volt alternating-current line would get the maximum of mean voltage. Mr. Means replied that he would get the maximum voltage which is considerably greater than the mean potential of 220 volts.

Mr. Barrett is of the opinion that after all pains are taken to make the grounding of alternating-current equipment as thorough as possible, an added precaution should be taken to insulate it, as no ground is reliable.

In the second half of the program, three papers were presented. The first of these, on "Abuse of Explosives," was delivered by W. J. German, of Huntington, W. Va.; the second, on "Explosion Hazards Investigation in Coal Mines," by J. W. Paul, Pittsburgh, Pa.; and the third, on "Rock Dusting of Coal Mines; Efficacy, Methods and Cost," by Edward Steidle, Pittsburgh Pa. A general discussion followed the reading of these papers, led by John T. Ryan.

In discussing Mr. German's paper on explosives, R. D. Lambie remarked that the mine law of West Virginia requires explosives to be carried in fiber containers, Mr. German declaring that in most cases the men stuffed the explosives in their pockets. In a discussion as to whether it was a desirable practice to contract out the drilling, tamping and shooting of coal to be done at night and without supervision Mr. German said that some shotfirers unless carefully watched, especially at night, are liable to shoot two holes simultaneously. Mr. German favors air-spacing only where the thickness of the coal is less than the depth of the cut.

INFLAMMABILITY DEPENDS ON FUEL RATES

In his paper, which dealt entirely with the hazards of coal dust, Mr. Paul gave an empirical formula deduced from laboratory tests for determining the degree of inflammability of coal dust. It is $R = V \div (V + FC)$, in which R is the volatile ratio, V the volatile matter and FC the fixed carbon. This formula aids in establishing the minimum quantity of incombustible matter needed by any given mine dust to render it harmless.

In response to Mr. Alfred, Mr. Paul said that when the Bureau declared that 5 oz. of coal dust per lineal foot of entry would propagate an explosion it based that figure on dust from the Pittsburgh seam, which had a volatile percentage of about 36 and on an entry measuring 6x10 ft.

John T. Ryan said that with only a few months of experience the methods being used in the United States for rock dusting are superior to those used after years

of experimentation by Great Britain. This country should not follow European methods because conditions here are vastly different. In England, for instance, electric haulage is not used, labor costs are low and consequently mechanical means of distributing rock dust are not employed. The cost of rock dusting per ton of coal mined should be no higher in this country than in England for it will be done by machinery, whereas hand methods are often used in Britain.

Everett Drennen questioned whether all layers of rock and coal dust on roof, rib and floor should be considered in determining the percentage of incombustible matter, seeing that the two dusts might be stratified. It is certain, however, that when the waves in advance of the flame of an explosion dislodge and stir up the dust the stratification will be destroyed. Mr. Reed questioned the effectiveness of rock dust in a wet mine but Mr. Ryan explained that a mixture of wet rock and coal dusts is safe; when one dries out so does the other, for which reason a safe condition prevails, wet or dry.

Mr. Haas questioned whether the pulverizing plant should have as large a capacity as suggested by Edward Steidle, namely 1,000 lb. of rock dust per hour. Mr. Ryan replied that the crusher obtainable produces 1,000 lb. per hr., and furthermore that it is planned to have the plant operated by company men having other duties to perform.

The Institute adjourned at 6 p.m. It met again that evening at an informal dinner at the Hotel Tygart.

"V" SYSTEM NOW EXTENDS UNDER HEAVIER COVER

On the morning of the second day a party of seventy men drove in automobiles to the Norton mine of the West Virginia Coal & Coke Co., where mining by the "V" system with conveyors was observed. Better results are being obtained with this system as time goes on. When it was described in the Feb. 7 issue of *Coal Age*, coal was being mined in a section near the outcrop and under light cover. Two batteries are now working in as many sections under heavier cover. From 1,600 to 1,800 tons of coal are produced daily from these two sections. Room mining has been stopped; The Norton mine, therefore is a mechanical mine. A precaution has been taken recently to settle the dust raised where the coal discharges from one conveyor to another. Small water lines are tapped from the drainage pipes and conducted to these points where the water is sprayed on the coal through a stationary nozzle.

The action of the roof apparently can be better controlled under the heavier cover. Falls of roof have less tendency to encroach on the protruding points, which, to all appearances are being kept open after each cut with a fair degree of regularity. Stumps lost in the goaf as far as could be seen are neither long nor wide, indicating a recovery higher than that obtained near the outcrop.

The mine officials explained that some minor changes will be made in the layout of the system. Ten faces instead of eight faces will be worked in a battery. The distance between galleries, also, will be increased from 80 to 100 ft., so that, the faces, still maintained at an angle of 45 deg., will be increased in length to 100 ft. The face conveyors, accordingly, will be made 87 or 93 ft. in length depending upon the results obtained; and five men instead of four will put coal on the conveyor. Two batteries of this size will produce about 2,500 tons of coal per day.

Should Buffalo's Gas Be Made at the Coal Mines?

By So Doing One and One Quarter Cents Would Be Saved per Thousand Cubic Feet, Provided There Were No Leakage—Outlay of Two Million Dollars Required

SEARCHING for cheaper fuel to replace the natural gas which is coming in decreasing quantity to Buffalo, N. Y., and gas manufactured by obsolete equipment by a company in financial difficulties that city established a co-operative agreement with the U. S. Bureau of Mines for the purpose of solving its problem. A report entitled "A Fuel Problem for the City of Buffalo, N. Y." has been made by G. S. Brewer, assistant fuel engineer, U. S. Bureau of Mines and B. J. Hatmaker, consulting geologist, department of public works, Buffalo, N. Y. which is extremely valuable and interesting. Among other matters the authors discuss the possibility of making gas at the coal mines and piping it to Buffalo. The following is a quotation from that report:

Some of the gas journals of late have given much space to the possibility of producing gas from coal at the mine and transmitting it through a long pipe at high pressure to the point of consumption.

In order to indicate whether or not such a plan would be feasible for Buffalo, the estimates in Table I have been made:

Table I—Estimated Cost of Transmitting Gas by Pipe Line from Coal Mine to Buffalo

(Compared to Shipping the Coal by Rail to Buffalo and Making Gas Locally.)

Cost of pipe line, capacity 1,000,000 cubic feet per hour (125 miles long @ \$1,000 per mile per inch of diameter of pipe using 12-in. pipe).....	\$1,500,000.00
Cost of compressor station	\$437,000.00
Interest and depreciation on pipe line at 10 per cent.....	\$150,000.00
Interest and depreciation on compressor station at 12 per cent	\$52,500.00
Operating cost of compressor station per year	\$49,200.00
Total cost of transmitting gas pumped per year based on present estimated requirement of 5,363,000 M. cu.ft.	\$251,700.00
Surplus coke produced at the mine.....	7,100 tons
Freight on coke assumed shipped to Buffalo for domestic use at \$2.60 per ton	\$18,500.00
Total cost transmitting gas and shipping surplus coke per year, \$251,700 plus \$18,500.....	\$270,200.00
Cost of transmitting 1,000 cu.ft. of gas and accompanying coke	0.0504
Cost of shipping coal to carbonizing plant in Buffalo per 1,000 cu.ft. of gas produced from it.....	0.0627

(1) Compiled from Weymouth, Thomas R., Transactions American Society of Mechanical Engineers, Vol. 34, 1912, page 183; and from minutes of hearings of the Buffalo Gas Case of 1918 before the Public Service Commission of New York.
Gain due to production of gas at the mine per 1,000 cu.ft. .0123
This does not take into account any gas loss due to leakage in the pipe line.

The cost of the pipe line was based upon figures given by Mr. Weymouth and from the cost of laying a pipe line from Cattaraugus Creek to Buffalo, a distance of 34 miles. The figures quoted are \$900 per mile per inch of pipe diameter, but because the cost of constructing a pipe line over the hills of Pennsylvania to the coal mine would probably be more than estimated for building it across the more level section of New York State, in this report \$1,000 per mile per inch diameter of pipe is assumed. Interest and depreciation charges are given at a rate of 10 per cent which is said by Mr. Weymouth to be a safe assumption.

The quantity of gas required per day was estimated throughout the year at 266 cu.ft., daily per meter with approximately 105,000 meters installed. A little allowance was made also for increase in demand, bringing the total estimated quantity up to 24 million cubic feet per day. By empirical formula, the horsepower of the

compressor was computed to be 4,370. This horsepower is sufficient to pump a maximum of twenty-four million cubic feet of gas per day.

Mr. Weymouth's figure of \$100 per installed horsepower as the cost of compressor stations was used making a total cost for the 4,370 hp. station \$437,000. Again using Mr. Weymouth's figures, interest and depreciation charges at 12 per cent = \$52,500 for the compressor station. Operating expenses at \$15 per horsepower per year assuming 75 per cent of the total capacity as the yearly average actually used mount to \$49,200. Therefore, the total yearly cost of operating a pipe line 12 in. diameter, 125 miles long using an initial pressure of 370 lb. per square inch absolute, a terminal pressure of 50 lb. per square inch absolute, pumping a maximum of twenty-four million cubic feet of gas per day and a total of 5,363,000 M. cubic feet per year, the specific gravity of which is assumed to be 0.60, figures to be \$251,700.

PIPE GAS FOR FIVE CENTS PER THOUSAND FEET

The cost of transmitting gas through this pipe line per M. cubic feet will therefore be,

$$\frac{251,700}{5,363,000} = \$0.0469 \text{ per M. cu.ft.}$$

In the coldest weather it is assumed that large quantities of water gas will be made and mixed with the coal gas. In order that the gravity of the gas may not change too greatly, some water gas should be mixed with the coal gas even during the period of minimum demand for gas.

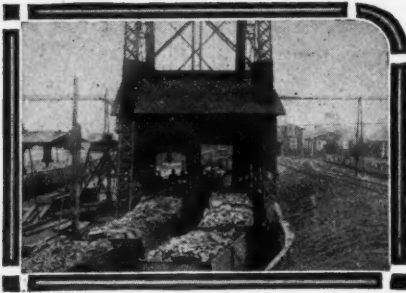
The total quantity of blue water gas required per year is estimated at 3,863,000 M. cu.ft. The coke required to make this allowing 39 lb. of coke per 1,000 cu.ft. blue water gas is 75,400 tons. Allowing 300 lb. of coke for bench or oven fuel per ton of coal carbonized, 150,000 tons of coal would require 22,500 tons of coke. Subtracting these quantities from a total of 105,000 tons of coke made per year, 7,100 tons remain to be sold, either in Buffalo or elsewhere. In this computation we shall assume that both the mixed gas and the excess coke are used in Buffalo. The freight on 7,100 tons of coke from the mine to Buffalo, assumed at \$2.60 per ton is \$18,500. The cost of transmitting gas and shipping coke to Buffalo, therefore totals to \$270,200 or \$0.0504 per M. cu.ft. of gas produced.

On the other hand, the freight on 150,000 tons of coal at \$2.24 per ton from Pittsburgh amounts to \$336,000 or \$0.0627 per M. cu.ft. of gas made, a gain of \$0.0123 per M. cu.ft. for gas made at the mine, assuming no pipe line leakage.

From a study of these figures it is apparent that the saving from the production of gas made at the mine over the production of gas made locally will be slight. If there is any appreciable leakage in the pipe line, and usually it is considerable, the gas that finally reaches Buffalo would have to be sold at a figure which would be substantially higher than that for gas manufactured locally.



News Of the Industry



Reorganization of Statistical Bureaus Beset by Thorny Path

Transfer of Compilation of Mineral Data Opposed by Census Department
as Well as Geological Survey—Industry Interested Pending Clarification of Legality of Issuance of Association Data

BY PAUL WOOTON
Washington Correspondent of *Coal Age*

Correspondence reaching Washington indicates a misapprehension on the part of the mineral industries as to the status of the reorganization legislation. The proposed plan which would transfer the statistics of mineral production from the U. S. Geological Survey to an enlarged Bureau of the Census, to be known as the Bureau of Statistics, is far from being an accomplished fact. The whole question of reorganizing the government departments is so intricate and controverted that it is entirely possible that no legislation along the lines indicated in the Mapes bill will pass. Before any such plan is made effective it is safe to predict that it will have been amended in a great many particulars. The prospects are that the proposal with regard to the mineral statistics will not be approved, as it is opposed in the Bureau of the Census as well as in the Geological Survey.

Industry Depends on Survey Data

It is evident that the anxiety of the mineral industries concerned with statistical services is due to the reliance that must be placed on these figures as long as the status of trade associations remains in doubt. Many of these organizations have abandoned a portion of their statistical program pending the clarification of their legality. For that reason such statistics as are issued by the government assume an increased importance.

Various of these inquiries apparently were prompted by an article in this correspondence which appeared on page 885 of the June 12 issue of *Coal Age*. It was not the intention in that article to give the impression that any such change is imminent. That article was prompted simply by the fact that the joint committee on reorganization had submitted its report to Congress. Since four years have been required to initiate the legislation, an indication is given of the difficulties likely to surround its further progress. Likewise in that article there was no intention of reflecting on the general efficiency of the Bureau of the Census. In the effort to reflect the widely held opinion that such statistics as those of mineral resources should be compiled by the specialists who have to use them and

who are in a position to interpret them, reference was made to the difficulties surrounding the compilation of such figures by a central statistical agency.

The Bureau of the Census and the Geological Survey are typical of two distinct methods of approaching the statistical task. The Census Bureau deals with a wide range of subjects, in addition to the task of enumerating the population. In the accomplishment of such work its performance is remarkable. One of the striking accomplishments of the federal government is the effective way in which the Census organization, within a very few days, makes the count of the nation's people. The Bureau of the Census is the largest agency of its kind in the world and was the first to develop machine methods of tabulating statistical facts. Much of the tabulating and assorting machinery in operation in that Bureau was invented and developed by Census employees. In no other statistical organization in the world have costs been reduced to such a low level. As Secretary Hoover puts it, the Bureau dredges up great buckets of facts.

Statistics a Means to Larger End

The Geological Survey, on the other hand, produces a type of statistics in which the statistical results are regarded not as an end in themselves but as a means to a larger end—an understanding of the industry. The secret of their merit is the vital contact between the collection of the data and their application to the industry.

Industry is not interested in the department or in the bureau which handles its statistics. It is generally recognized by industry, however, that the work should be done by those who make it their permanent job to study some particular specialty. Thus the coal statistics are handled by coal specialists, the oil figures by petroleum specialists, rare metals figures by men who devote their entire time to that specialty, and so on through the list.

It has been the employment of this principle of specialization on commodities that has given such strength to the Bureau of Foreign and Domestic Commerce of the Department of Commerce. In that Bureau are specialists who deal

Hocking Miners Want Scale That Will Get Work

Forty-eight delegates, representing approximately 12,000 union miners in the Hocking Valley field, recently unanimously adopted a resolution inviting mine owners and operators in this section to meet in joint conference to discuss amendments to the wage scale and working conditions with a view to cheapening the cost of mining. It is understood that operators have signified their intention of accepting the invitation and the joint session probably will be held early in July. Mines in this section have been idle for months, owing to inability to compete with other mining fields.

with single commodities who can use and interpret statistics to the utmost advantage. The Geological Survey organization carries that type of co-operation one step further. It places the collection of commodity statistics under the supervision of the commodity specialists and weaves the quantitative results into one complete picture along with qualitative results of observation and intimate acquaintance with the field.

Lewis Again Warns Against Wage Reductions

John L. Lewis, president of the United Mine Workers, reiterated at union headquarters in Indianapolis, June 19, that the international organization, which suspended the autonomy of District No. 17, West Virginia, and assumed charge of the union affairs there June 14, will not submit to any reduction in miners' wages. The declaration was made in an official circular announcing the change in the West Virginia district.

"Strikes now in effect will be prosecuted until settlements are reached on the basis of the Jacksonville agreement," the official announcement reads. "There will be no modification of existing wage agreements now or later."

It was stated that operators in a few other districts have refused to sign contracts based on the Jacksonville agreement, and the union has declined to concede a wage reduction demanded by the operators, thereby causing strikes in places other than West Virginia. The declaration of policy regarding West Virginia in the official circular was said at union headquarters to be regarded as notice that no wage reductions will be permitted anywhere.

Strike in German Coal Mines Proves Unprofitable to Workers

Conceded 15 per Cent Increase from the First, Miners Obtain 20 per Cent Advance and Recognition in Principle of Seven-Hour Day—Will Work Eight Hours Daily for the Present

Berlin, June 6.—After a strike lasting nearly four weeks and causing enormous losses, the Ruhr coal miners have resumed work, on condition that they get a 20-per cent increase of wages from June 1 and that, while the seven-hour day is recognized in principle for underground workers, eight hours will be worked for the present. As a 15-per cent wage increase was conceded from the first, the strike proved highly unprofitable. The wages lost by 450,000 strikers total 58,800,000 gold marks; and the production loss of 7,194,000 metric tons would have had a value of 149,850,000 gold marks, or nearly seven times as much as in the last important strike in 1912.

Production has now returned to about the post-war normal. Owing to the Ruhr troubles 1923 was not a normal year; but it is given here together with 1922 and 1913 for purposes of comparison, the figures (in thousands of metric tons) referring to the whole of Germany:

	Output	Imports	Exports	Consumption
1923..	97,607	25,000	2,000	120,676
1922..	175,500	15,427	23,577	167,550
1913..	219,186	16,200	44,043	189,403

Owing to the large imports and meager exports in 1923, the quantity available for home consumption was not so dangerously curtailed as would appear from the production figures taken alone. The home production in the first four months of 1924 was on the whole satisfactory, being as follows in thousands of metric tons:

	January	February	March	April
Coal.....	8,787	9,726	10,825	10,429
Lignite (brown coal).....	9,553	8,327	10,931	10,247
Coke.....	1,474	1,742	2,102	2,219

In the first quarter of 1924 coal output exceeded that of the corresponding quarter of 1923 by 3,750,000 tons, whereas output of lignite (which was forced in 1923 owing to shortage of Ruhr supplies) was 7,320,000 tons less. The coal figures do not include the output of three mines which are worked directly by the French Régie. Imports of coal this year have fallen to about half those of 1923, as shown in the subjoined table in thousands of metric tons:

1924	Coal	Lignite	Coke
January.....	1,087	117	81
February.....	1,232	138	54
March.....	980	169	25

Against this, exports of coal and lignite, though not of coke, have fallen; and Germany's foreign payment balance is still heavily burdened by the coal import surplus, though not so heavily as last year. Exports were as follows in thousands of metric tons:

1924	Coal	Lignite	Coke
January.....	97	7	25
February.....	69	12	36
March.....	63	17	40

In spite of pessimism in business circles there has been no serious shortage of coal for industry since the war, except in 1923 and during the May (1924) strike. The reasons for this are the greatly increased output and direct use of lignite, increasing electrical generation with lignite, more economical methods of firing, increased imports and greatly reduced domestic consumption. The recent curtailment, however, was not due to a shortage. The rationing of fuel for domestic use ceased



H. K. Cortright

President of the American Wholesale Coal Association, elected to succeed C. L. Dering at the recent convention of the association at White Sulphur Springs, W. Va.

two years ago. The chief cause was the temporary inability of large classes to pay for fuel, which was burdened formerly with a 40 per cent tax, since abolished. High prices led to a general suspension of central heating in city houses. No figures for all Germany are available; but in October, 1923, the consumption of lignite briquets for domestic heating in Berlin fell to 41,165 tons against 160,690 tons in October, 1922. Owing to the rentenmark currency reform, which has largely increased the average citizen's buying power, central heating is now being resumed everywhere.

The German coal trade is in a confused condition. The abolition of state control and rationing has resulted in the disappearance of binding prices; thousands of small dealers have sprung up, who ignore the syndicates' attempts to keep prices steady. When short of money, as most German business men are today owing to the credit crisis, these new dealers sacrifice their stocks of coal at prices below production cost and willingly bear the loss rather than apply for bank credit, which costs 60 to 80 per cent per annum on

Every Stockholder A Coal Seller

Foreseeing a period in which retail coal selling will not be lucrative, the Consumers Co., of Chicago, is entering upon a most intensive sales effort. Fred W. Upham, nationally prominent Republican politician and president of the company, has sent out a letter to all his stockholders telling them the company has consistently paid a 7 per cent dividend every six months and hopes to continue it but that if there is to be any profit out of the business in this year of narrow margins the company must sell at least 25 per cent more coal. In order to do this every employee is under orders to consider himself a salesman and bring in business. The same appeal is made to every stockholder.

first-class security. At the Coal Dealers' annual Congress, held this week, the representatives of the big dealers appealed for united action to suppress the so-called "savage" (outside) dealers.

Germany's coal future is very doubtful, depending as it does upon restoration of her economic control over the Ruhr. Although such restoration is one of the main conditions of the Dawes reparations recommendations, not much confidence is felt. Meantime Germany's control over coal fields is so small that she has declined from first position to fourth among European coal powers. In 1913 her underground coal reserves were estimated at 424 billion tons, or 52.1 per cent of the reserves of all Europe; Great Britain coming next with 189 billion tons, or 23.2 per cent; European Russia next with 50 billion tons, or 7.4 per cent. Through the Versailles Treaty Germany lost the Lorraine fields with 800 million tons, and the Saar with 12,200 million tons; and through the Geneva decision of 1922 she lost the greater part of the East Silesian coal fields, estimated at 176 billion tons. In all her loss was 189 billion tons.

Allowing for Poland's gains and European Russia's losses, the position today is as follows: Germany, 235 billion tons, or 28.9 per cent of all Europe's supplies; Poland, 208 billion tons, 25.6 per cent; Great Britain, 189 billion tons, or 23.2 per cent; Russia, 47 billion tons, or 7 per cent. Germany, however, has since lost control over the greater part of the above share as a result of French occupation of the Ruhr and Left Rhine fields. She controls today (including lignite) only about 64 billion tons, or 7.9 per cent of all Europe's supplies, being behind Poland, whose supplies are given above; behind France, which now controls 202 billion tons, or 24.8 per cent, and behind England. Her directly owned and controlled fields contain the following estimated reserves in metric tons:

Lower Silesia.....	3,000,000,000
Upper Silesia.....	35,000,000,000
Westphalia.....	19,000,000,000
Saxony.....	1,000,000,000

In addition are 6 billion tons of lignite in unoccupied territory, mainly in central Germany.

St. Bernard Miners Take 20 per Cent Wage Cut

Some of the union employees of the St. Bernard Mining Co., in western Kentucky, have agreed to go back to work at a wage scale 20 per cent below the standard union rate. The company made the deal with certain of its men last week and expects to open four of its mines some time this week. It is still uncertain, however, as to how many will go to work. The agreement puts the St. Bernard properties on an open-shop basis with a wage scale paralleling that of the West Kentucky Coal Co., whose mines have been open-shop for a long time and whose men were reduced to the 1917 scale about two months ago. The St. Bernard mines were purchased last spring by the North American Co., which owns and operates the West Kentucky Coal Co.

Although it was announced at Earlington, headquarters of the St. Bernard company, that about 1,000 men had agreed to resume work, Lonnie Jackson, of Central City, president of the western Kentucky district of the United Mine Workers, hooted at the idea, declaring late last week that only a handful of St. Bernard men had agreed to the wage cut and that not enough men would report to man one mine, not to mention the four the company proposes operating. He did not openly issue any threats concerning what the union will try to do to stop this long-expected spread of non-unionism in western Kentucky, but he did say that the loyalty of his district is unquestioned and that there is no danger of a break in the ranks of the men who have been on strike since April.

It is generally known that President Jackson has frankly admitted that the union miners in western Kentucky ought to take a 20 per cent cut. He was rebuffed severely, however, when he and his district board went to Indianapolis, Ind., and tried to get International President John L. Lewis to sanction it. The delegation was sent back home with orders to fight it out. That is what Jackson is still trying to do.

Ever since negotiations between operators and miners were broken off in April, shutting down practically all of the field except the several mines of the open-shop West Kentucky Coal Co., it has been freely prophesied that the

Shake-Up in Bureau Of Mines

A number of changes have been made in the technical division and offices of the U. S. Bureau of Mines as the result of an order approved by the Secretary of the Interior, Dr. Hubert Work. The division of metallurgy has been placed under the direction of the chief metallurgist, who will have administrative charge of the field studies now being conducted at Miami, Okla.; Moscow, Idaho; the Massachusetts Institute of Technology and at the Bureau of Standards, together with the co-operative studies on oxygen enrichment of air blasts.

George S. Rice, chief mining engineer, has been relieved of most of his administrative duties and will serve as adviser to the director and assistant director on mining matters, with such special duties as may be assigned to him from time to time. For the present he will be in entire charge of matters relating to co-operation with the British Government in studies of safety in mines. The division of war mineral supplies has been abolished and its duties, records and personnel have been transferred to the division of mine research.

union would have to take a wage cut or quit business. The St. Bernard mines, normally employing 2,300 men, were at once the largest group in the striking field and the weakest spot in the union's front. Relations between that company and its men have been cordial and when the company recently issued a sort of ultimatum to the men through Frank D. Rash, operating head under the direction of C. F. Richardson, president of the West Kentucky Coal Co., showing the men how economically impossible it is for the mines to be opened at the union scale, the back of the strike gave evidence of breaking. Some of the men asked on what basis they could go to work. The company told them to determine that among themselves and come back with a proposition. The 20 per cent cut was the result.

The rest of the field remains on strike and watching St. Bernard activities with great interest.

Discuss Steps to Prevent Mine Accidents

Important steps to prevent mine disasters were discussed at a meeting at Elkins, W. Va., June 18, attended by mine owners, mine officials and miners, the first of a series called by Robert M. Lambie, chief of the West Virginia Department of Mines. Approximately 100 employers and employees were present at the meeting. Mr. Lambie opened the discussion by pointing out that six mine disasters, exacting a toll of 398 lives, had occurred this year. At least 90 per cent of explosions could be eliminated, he said, through proper precautions, pointing out changes that should be made in thirty-six sections of the mining law of the state. Plans and suggestions for changes and revision of the law were then submitted for open discussion.

Important among the changes submitted by the mine chief and which met the approval of those attending the meeting was the use of approved electric mining lamps in all mines. The law at present enforces this practice in mines known to contain dangerous quantities of gas, but it is urged that the electric lamp be used in all mines. In this manner, Mr. Lambie declares, explosion hazards from gas ignition can be reduced 80 per cent.

It was pointed out that the present laws prevent the department from enforcing restrictions and safety measures in cases where oil and gas companies sink drills through coal veins. Through the use of permissible explosives in all mines at least 60 per cent of explosions due to fuse ignition can be eliminated. The present law covers only certain mines, as in the case of miners' lamps.

Among other important measures discussed and favored for incorporation in the state mining laws was the use only of certified shotfirers, who should be required to pass a state examination before entering upon their work, improved systems of ventilation, especially in the cases of new mines; rock dusting and rock-dust barriers.

The salient points which those present at the meeting discussed and which received the endorsement of all were ample ventilation, proper inspection by firebosses before work starts, adequate supervision, use of approved electric lamps, of which more than 8,000 are now in use in the state, permissible explosives only, certified shotfirers, permissible machinery in gas-liberating mines.

After the discussion had been concluded a committee of four was appointed to call further meetings for drawing up the best measures favorable to local miners and officials. At each of the other six meetings like committees will be appointed and they will later meet at Charleston with a commission to be appointed by Governor Morgan.

When the recommendations evolved as a result of all the meetings are finally whipped into shape for presentation to the Legislature, West Virginia is expected to have the most thorough and modern mining laws in the United States.



Coal Haulage in India at Five Cents a Ton

The ordinary method of moving coal from the face out of slope mines in India is by woman-power, 12-ton coal tubs familiar in various parts of the British Empire. S. W. Farnham says the Indian miner, who is a farmer part of the time, always insists upon taking his women into the mine with him, whether they work or not, in order to keep them in the straight and narrow path.

World's Production of Coal in 1923, 3,337,000,000 Tons, Largest Since 1917

World's production of coal in 1923, according to the U. S. Geological Survey, was the largest in any year since 1917 and fell somewhat short of that in 1913, the last year preceding the World War. The total output is estimated at 1,337,000,000 metric tons, as compared with 1,342,000,000 tons in 1913.

The failure of production to reach the pre-war level is the more significant when it is remembered that the world's consumption formerly increased by leaps and bounds. The average rate of increase in the 20-year period preced-

ing August, 1914, was 38,000,000 tons a year. In part the present low production is due to the economic disorganization wrought by the war, particularly in Germany, France and England. In part it is due to more efficient use of fuel, stimulated by the high prices of recent years. A factor of still greater influence is the extraordinary increase in the supply of petroleum. The world's production of crude oil in 1923 exceeded that of 1913 by 625,000,000 barrels, equivalent to approximately 170,000,000 tons of coal.

The term "coal" as used by the Geo-

Railroads Buy 28 per Cent Of Soft-Coal Output

Class 1 railroads of the United States in 1923 purchased directly from the industries of the country fuel, materials and supplies to the value of \$1,783,703,000, R. H. Aishton, president of the American Railway Association told the fifth annual convention of Railway Purchasing Agents in session at Atlantic City, June 16.

Of the total amount, \$617,800,000 was expended for fuel, Mr. Aishton said, or about one-third of the total expenditure. More than 28 per cent of the total amount of bituminous coal produced in the United States in 1923 was purchased by the railroads at a cost of \$519,007,000, while they also purchased 5.2 per cent of the total anthracite production at a cost of \$18,195,000. Fuel oil amounting to \$75,867,000 and consisting of about one-fifth of the total production and consumption in the United States also was purchased by the railroads, while \$4,731,000 was expended for other kinds of fuel such as coke and gasoline. These amounts represent expenditures on account of fuel for all purposes, whether for locomotives, shops or the heating of buildings.

Coal Produced in Principal Countries of the World in Calendar Years 1921, 1922 and 1923

(In metric tons of 2,204.6 lb.)

	1921	1922	1923 (Preliminary)
North America:			
Canada { Coal	10,684,259	10,587,611	11,254,007
{ Lignite	2,975,598	3,162,907	3,246,378
Greenland	2,200	2,100	(a)
Mexico	731,022	949,677	(a)
United States { Anthracite	82,076,000	49,607,344	86,585,000
{ Bituminous and lignite	377,316,000	383,073,174	494,772,000
South America			
Argentina	(a)	(a)	(a)
Brazil	(a)	500,000	(a)
Chile	1,275,117	1,053,001	(a)
Colombia	(a)	(a)	(a)
Peru	345,481	249,492	(c)
Venezuela	(b) 22,094	(b) 20,782	(a)
Europe:			
Austria { Coal	137,633	165,727	158,183
{ Lignite	2,478,862	3,135,902	2,658,907
Belgium	21,750,410	21,208,500	22,916,074
Bulgaria	939,586	1,030,036	1,063,662
Czechoslovakia { Coal	11,648,399	9,906,261	11,624,748
{ Lignite	21,050,712	18,942,920	16,202,496
France { Coal	28,211,839	31,163,032	37,682,235
{ Lignite	748,634	777,813	861,435
Germany { Coal	136,227,231	(c) 129,964,597	62,224,535
{ Lignite	123,010,036	137,207,125	118,248,735
Saar	9,574,484	11,240,000	9,121,285
Greece	168,576	131,515	(a)
Hungary	6,417,960	7,717,610	7,709,775
Italy { Coal	114,236	195,352	168,922
{ Lignite	1,026,035	745,402	938,229
Netherlands { Coal	4,243,000	4,866,371	5,598,555
{ Lignite	121,715	28,919	(a)
Poland	7,842,533	(d) 24,194,797	36,097,997
Portugal	135,732	(a)	(a)
Rumania	1,804,687	2,116,221	2,366,068
Russia	7,550,800	7,781,400	(f) 11,707,393
Spain { Coal	5,012,229	4,435,843	5,929,202
{ Lignite	408,674	329,680	359,582
Spitzbergen	210,000	316,000	340,942
Sweden	376,692	378,861	(a)
Switzerland	10,714	3,380	(a)
United Kingdom:			
Great Britain	165,781,404	253,613,054	282,970,535
Ireland	89,958	(a)	(a)
Yugoslavia	3,063,198	3,726,568	(g) 4,000,000
Asia:			
British India	19,612,759	19,316,112	19,019,000
China	19,876,375	21,300,000	(a)
Chosen	310,590	317,330	(a)
Federated Malay States	304,156	286,351	(a)
Indo China	920,900	988,991	(a)
Japan (including Twaina and Karafuto) (e)	27,375,367	29,150,000	27,800,000
Russia	1,363,800	1,276,900	(f)
Turkey	(a)	(a)	(a)
Africa:			
Algeria	9,541	8,855	(a)
Belgian Congo	2,990	33,000	(a)
Nigeria	216,262	123,027	173,422
Rhodesia, Southern	521,404	467,787	559,999
Tunisia	22,207	343	620
Union of South Africa	10,339,044	8,830,774	10,809,501
Oceania:			
Australia:			
New South Wales	10,966,671	10,346,572	10,646,693
Queensland	970,087	973,903	1,155,079
Tasmania	67,543	70,349	82,014
Victoria	603,618	660,113	(a)
Western Australia	476,341	445,480	(a)
British Borneo	(a)	88,948	(a)
Dutch East Indies	1,212,665	1,032,310	(h) 1,000,000
New Zealand	1,838,131	1,887,637	(h) 2,000,000
Philippine Islands	39,445	(a)	(a)
	1,134,000,000	1,223,000,000	1,337,000,000

(a) Estimate included in total. (b) Exclusive of the State of Falcon (about 8,000 tons), for which estimate is included in the total. (c) Includes entire output of Upper Silesia for January-May; for June-December only that part of Upper Silesia allocated to Germany. (d) Includes for June-December that part of Upper Silesia awarded to Poland. (e) Exclusive of lignite from Japan (annual production of about 200,000 tons) for which estimate included in the total. (f) Russia in Asia included with Russia in Europe. (g) Estimate based on 11 months' production. (h) Estimated on incomplete data.

logical Survey includes lignite, and the production for the world is simply the total of quantities reported, no attempt being made to reduce the statistics for inferior coals to an equivalent tonnage of coals of higher rank. Where possible, however, coal and lignite are shown separately.

In comparison with 1922, the year shows an increase of 114,000,000 tons, in which the principal element was a recovery of 149,000,000 tons in the production of the United States. All of the large producing countries, however, except Germany, Japan and British India, reported an increase, and the output of France was but 3,000,000 tons below the pre-war level. The outstanding feature of the year was the tremendous decline in the production of Germany, associated with the economic disorders that attended the occupation of the Ruhr. The figures from Germany are official.

World Production of Coal, 1910-1923

(In metric tons of 2,204.6 lb.)

Year	Production, In Part Estimated	Per Cent Produced by United States
1910	1,160,000,000	39.2
1911	1,189,000,000	37.9
1912	1,249,000,000	38.8
1913	1,342,000,000	38.6
1914	1,207,000,000	38.7
1915	1,193,000,000 (a)	40.5
1916	1,291,000,000 (a)	41.5
1917	1,356,000,000 (a)	43.6
1918	1,333,000,000 (a)	46.3
1919	1,173,000,000	42.8
1920	1,319,000,000	45.3
1921	1,134,000,000	40.4
1922	1,223,000,000	35.2
1923	1,337,000,000	43.5

(a) Revised from earlier reports to conform with more accurate information on certain of the warring countries.

Midwest Dealers Still Fight Snowbirding

Charges against it and investigations into the affairs of its commissioner by the Federal Trade Commission have not dampened the ardor of the Midwest Retail Coal Association in its battle against "snowbirding." At its fourth annual convention, in St. Louis, Mo., last week, the association decided to continue its active existence and to back Commissioner E. J. Wallace in the work he has been doing. Mr. Wallace lambasted "government by commission" in his characteristic vitriolic language.

The association adopted resolutions demanding that Congress find out why the Federal Trade Commission fails to protect legitimate business against the doubtful advertising and questionable methods of coal "snowbirds," demanding that the commission compel concerns with no coal mines to cease using the word "mining" in their corporate names, asking the Interstate Commerce Commission to extend the unloading period on coal before demurrage begins, and calling the Commerce Commission's attention to the unsuitability of some of the railroad equipment now used in the Midwest and asking that at least half the coal cars built in the future be flat bottoms. A committee was appointed to study the feasibility of a state license system for retail coal dealers.

The association was addressed by L. P. Coan, an old-time St. Louis coal man, and by Walter Heinecke, D. H. Derbster, Arthur Hull and W. R. Schneider. A banquet wound up the one-day convention. The officers elected for the coming year are:

President, R. D. Kelly, Springfield, Mo.; first vice-president, W. A. Storrs, Hannibal, Mo.; second vice-president, H. R. Oglesby, Warrensburg, Mo.; third vice-president, F. W. Schramm, Farmington, Mo.; fourth vice-president, S. P. Guthrie, Mexico, Mo.; secretary, James P. Andriano, St. Joseph, Mo.; treasurer, F. L. Keightley, 1616 S. 39th St., St. Louis; commissioner, E. J. Wallace, Pierce Bldg., St. Louis.

Next year's convention will be in Springfield, Mo.

Ralph Clements Arrested On Fraud Charge

Ralph Clements, of Cleveland, former president of the defunct Valley Coal & Dock Co., Milwaukee, was arrested in Cincinnati recently charged on 19 counts by the federal grand jury with using the mails to defraud.

With him was named Bertram M. Ainesworth, Milwaukee, alias Bertram M. Altheimer, who is believed now to be a fugitive from justice. Clements was arraigned before a court commissioner in Cincinnati and upon entering a plea of not guilty was released on \$2,500 bonds.

The officers caused to be issued 10,000 circulars and numerous financial statements from time to time to creditors and coal operators from whom they solicited credit in which they claimed they had taken over the entire assets of the Valley Coal Co. and that the new capitalization was then in excess of \$300,000, paid in cash, when in fact they did not have any paid-in cash capital whatsoever.

Northwest Rate Changes Are Delayed a Month

Although the Interstate Commerce Commission ordered higher rates from southern Illinois into the Northwest to take effect Aug. 21, a 30-day postponement already has been granted at the request of the railroads, and the lines are asking for another 30 days. They claim the complicated business of making new rate schedules and issuing the tariffs cannot be done even by Sept. 21 and that the date should be Oct. 21.

Thus begins the expected series of delays and counter movements against the new ruling which gives the Northwest docks an advantage over the all-rail shippers into Minneapolis and St. Paul and into certain other rate zones of the Northwest. The decision ordered advances of 8c. and 15c. a ton on rail coal from southern Illinois into two zones of southern Minnesota and 28c. into the Twin Cities, whose coal consumption is about half that of the entire State of Minnesota.

Bureau of Mines Awards Coal Contracts

The U. S. Bureau of Mines has awarded to the Philadelphia & Reading Coal & Iron Co. contracts for anthracite on the basis of bids opened May 28. The contracts call for the delivery during the coming fiscal year of 1,320 tons of broken at \$8.65 per ton; 5,730 tons of egg at \$9.25; 5,940 tons of stove at \$9.40; 1,650 tons of nut at \$9.25; 100 tons of pea at \$6.25, and 250 tons of red ash at \$9.90.

The only contract so far awarded by the Bureau of bituminous coal is for 54,000 tons of New River run of mine for delivery to the Government Fuel Yards, purchased from the Minter Fuel Co., Inc., Beckley, W. Va., at \$2.19 per ton.

Miners and Guards in Battle At Brady Mine

For the second time since the Brady-Warner Coal Corporation started the operation of its mines on an open-shop basis an attack was made on the mining settlement at Brady early in the morning of June 19 and four union miners have been arrested. One man was wounded during the attack, the union hall at Brady was destroyed by fire and a number of houses occupied by mine guards and non-union miners were riddled by bullets during the course of a two-hour battle.

Trouble started during a demonstration staged by an organization known as the "Regulators," to which many union miners and their sympathizers belong, according to the testimony of miners. During this demonstration dynamite was set off and then the firing of shots from a steep hillside was started. The mine guards in the settlement returned the fire and for a time there was an exchange of several hundred shots.

When Sheriff Yost, of Monongalia County, arrived at Brady the union hall was on fire but shooting had ceased. Officers found the settlement panic stricken, many of the miners and their families having hidden in cellars. The four union miners placed under arrest admitted that they were formerly in the Brady mines.

During the attack on the Brady mining settlement, the mining community of the Francois Coal Co., about three miles away, also was attacked and a few shots fired.

Samuel D. Brady, president of the Brady-Warner company, stated following the attack that "We propose to operate the mine at all hazards," adding that the constitution "gives the company the right to enjoy its property and to operate as long as the plan is within the law."

Attributes Outlaw Strikes to Disbelief in God, Gospel or Hell

The investigation into the numerous petty strikes that have tied up collieries in anthracite district No. 1 got under way in Wilkes-Barre, Pa., June 18, when five International board members, comprising an investigation committee appointed by John L. Lewis, International president of the United Mine Workers, heard testimony from district union officials on the causes ascribed for the outlaw strikes.

Rinaldo Cappellini, president of District 1, threw much light on the underlying cause of the outlaw walkouts in the following statement to the committee: "Almost every morning when I get out of bed I read in the papers of another unauthorized strike called by a local union or a general grievance committee. There are men in District 1 who do not believe in God, the gospel or hell, and these men

would do anything. There are several nests of I. W. W. in the district and other miners, believing it will be a nice day tomorrow and who want to go fishing, strike or declare a holiday. This must be stopped if the United Mine Workers are to act as a unit."

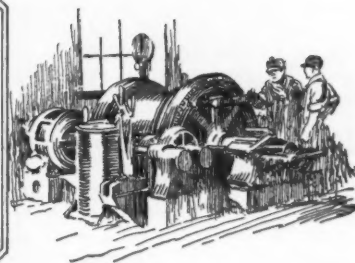
Cappellini also declared that the refusal of company officials to hear grievances has resulted in several strikes.

The investigation will continue into this week, with a session in Scranton. Many district officials will be called before the investigating committee, and it is also expected that alleged radical leaders in the Pittston field will be summoned for examination.

No hint has been given as to the resultant action of the committee following the probe. It is understood that a full report of the investigation will be turned over to President Lewis.



Practical Pointers For Electrical And Mechanical Men



Minor Changes to Locomotive Reduce Haulage Costs Ten Cents a Ton

Storage-battery locomotives have filled a great need for some form of haulage equipment which may be used more safely than a trolley locomotive near the coal face. However, they have other advantages, especially where the expense of bonding rails, installing trolley and feeder lines would be large.

In low coal, battery locomotives obviate the necessity for blowing down roof rock or taking up bottom in the haulageway. Even if height were made so as to give minimum headroom for the trolley wire it nevertheless would be so low as to be dangerous to the workmen and that fact probably would cause annoying delays to the system whenever a car jumped the track and grounded the circuit or tore down the wires.

Another advantage of the storage-battery locomotive, which will become increasingly more important as years go by and thinner beds must be mined, is the fact that it may be made small. Mining costs in some mines largely depend upon the width of the roadways. A wide locomotive requires so much room to turn curves that it is frequently necessary to do much special and expensive mining work to accommodate them.

At one of the Pennsylvania Coal and Coke Corporation mines near Cresson, Pa., a saving of 10c. a ton was made in one section by decreasing the width of a locomotive. Originally the locomotive was equipped with outside wheels but had a relatively wide bearing housing as shown in Fig. 1.

By reducing the width of the housing $2\frac{1}{2}$ in. and obtaining a narrower roller bearing to suit, the total width of the locomotive was reduced 5 in. Upon further inspection it was found that another reduction of 1 in. could be obtained by shortening the inside hub of the wheels. By doing this the hous-

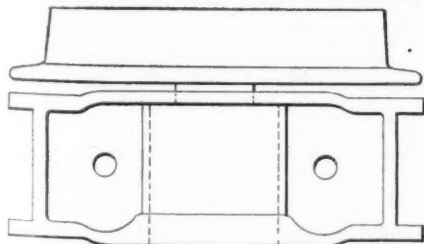


Fig. 1—Original Arrangement of Bearing Housing and Wheel

Although the locomotive had been equipped with outside wheels so that the overall width would be small, the bearing housing was unusually wide and could be greatly reduced.

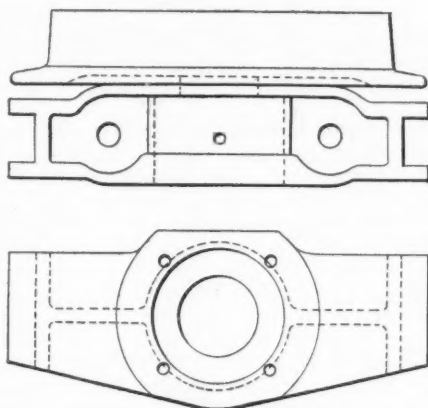


Fig. 2—How Housing Was Narrowed and Wheels Relocated

A new type of roller bearing was obtained for the narrower housing and the inside wheel hub cut off to reduce the total width of the locomotive 6 in.

ing fits closer to the recessed part of the wheel as shown in Fig. 2. By making other changes to the driving axles, bumpers, side frames and battery boxes the width of the locomotive was reduced 6 in.

Keeps Controller Fingers and Segments from Burning

There are two essentials to the satisfactory and economical operation of controller fingers. They are lubrication and contact pressure.

Large-capacity fingers, $\frac{3}{4}$ and 1 in. wide, are made of copper and slide over copper contact segments. Both finger and segment, being of the same composition and comparatively soft, will wear excessively unless properly lubricated. The quality of lubricant used varies somewhat with the climate and temperatures, but vaseline will be satisfactory for summer and for moderate winters, and engine oil is satisfactory during cold seasons.

It has been general practice in the past to use large quantities of lubricant, with the idea that the more used the longer it will remain on the contact segments. This is erroneous, as the surplus soon wipes or burns off and accumulates on arc barriers, fingers and drum castings, collecting copper dust and dirt, with a resulting tendency toward insulation failure. The contact segments also become sticky and dirty. The best practice is to spread the lubricant as smoothly over the segment as possible with a cloth, operate the controller fingers over the segments several times, and then wipe around the finger and the segments to remove any surplus.

The preceding information is pri-

marily for fingers and segments for arcing duty. Where non-arcing duty is performed, much less lubricant can be used, and it should be of a lighter grade. Contact segments and fingers become roughened by arcing and should be carefully smoothed up with emery or a file before lubrication is applied. Contacts usually start cutting in two or three days. A wire-drawn contact surface should be carefully smoothed and wiped off.

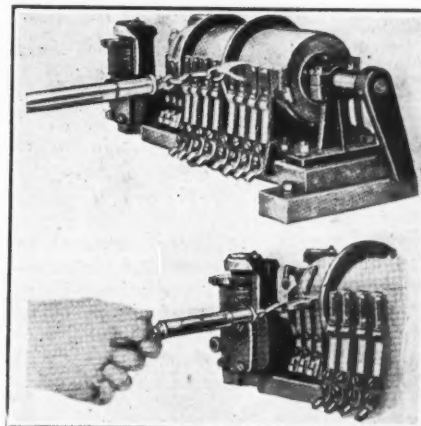
Small fingers, $\frac{1}{4}$ -in. and $\frac{3}{8}$ -in. wide, are usually made of different material from the contact segments, thus causing less cutting.

The safe current density on a finger depends on the width of the contact surface, the pressure at the point of contact and the mass and radiation of the finger and segment. The capacity for a given width increases with the pressure, but too heavy pressure causes excessive wear and stiff controller drums.

Average practicable finger pressures for general service, copper fingers on copper segments, are listed below. For different contact materials these values may be increased somewhat.

Sizes of Finger in Inches	Pounds Pressure
1	8
$\frac{3}{4}$	6
$\frac{1}{2}$	4
$\frac{3}{8}$	2

By means of a small spring balance and a wire stirrup the pressure is easily checked, as shown in Figs. 1 and 2, and inspectors soon become accustomed to the feel of a finger with correct pressure.



Figs. 1 and 2—Testing the Pressure of Contact Fingers

Depending upon its width a finger should have a pressure of from 8 to 2 lb. This pressure should be measured when the finger is making contact with a segment. Otherwise incorrect results may be obtained. The finger is usually resting against a stop when not making contact on a segment, and therefore may be quite loose.

Pressure is varied by changing the bend in the flat finger spring. After bending see that the finger is making contact along its full width. Most fingers have an adjustable stop, which limits the drop of the finger tip when it leaves the contact, but this stop does not vary the finger pressure. Its sole purpose is to prevent stubbing. The drop should be set at $\frac{1}{16}$ -in to $\frac{1}{8}$ -in. or enough to allow the finger to lift entirely free from the stop when the finger is on the contact. This allows full pressure at the contact surface. The lift should be checked in all positions of the drum, as an eccentric drum, or one having worn bearings and shaft may have good finger pressure in one position and weak pressure in another.

The considerations just mentioned are equally important when installing new fingers or contact segments. A new finger should preferably be ground in with emery cloth to give a contact area at least $\frac{1}{8}$ -in. in width along the contact line, and the finger should make contact over at least three-fourths of its breadth. Drum-controller maintenance cost can be kept at a minimum and failures reduced by keeping in mind these simple instructions.

Theory of Transformers

A transformer is an electrical device used to change alternating current from a given voltage value to alternating current of the same frequency but different voltage value. Generally this device is distinguished from a rotary-

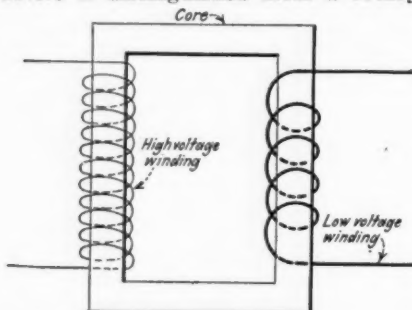


Fig. 1—Construction of Transformer

The usual type of transformer consists of two separate windings. One coil generally consists of many turns of fine wire and is called the high voltage winding; the other coil consists of heavier wire and is called the low voltage winding. The magnetic linkage from the coil to which power is supplied to the other coil produces the secondary voltage.

converter or rectifier, which changes alternating current to direct current, or vice versa by being termed a static transformer.

Transformers are therefore used to raise or lower the voltage of alternating-current circuits. Their principal application is in the transmission and distribution of alternating-current energy. Aside from this transformers are used for regulating voltage and for measuring purposes.

By means of transformers, we may transmit large amounts of electrical energy at high voltages which permit the use of small wires correspondingly long without prohibitive expense for copper, line construction or excessive loss of energy. At any point along such a line where we may need power it is only necessary to tap on a trans-

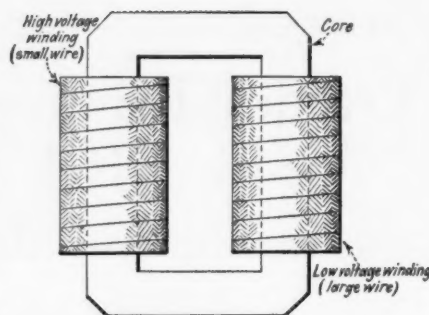


Fig. 2—Core-Type Unit

In this construction the coils surround the laminated iron core. This arrangement is similar to Fig. 1, however, the two coils are usually built one inside the other.

former and change the voltage down to any desired value.

Structure of the Transformer.—A transformer consists of two independent mutual induction coils of insulated wire, strap or bar placed on an iron core. One coil is called the high-voltage winding and the other the low-voltage winding. See Fig. 1. One or the other of these windings is connected to a source of alternating current and the other delivers alternating current to a given load. Irrespective of whether it be the high- or the low-voltage winding, that coil which is connected to the source of power is called the primary and the other the secondary.

Principle of Operation.—The alternating-current flowing in the primary winding produces in the iron core an alternating magnetic flux which links with the secondary winding and produces in it an induced alternating-current voltage. By properly selecting the number of turns of wire in each coil a transformer may be designed to raise or lower a voltage of any value to another of any desired value. When a transformer is used to change a voltage to another of lower value it is called a "step-down" transformer and when it is used to raise a voltage it is called a "step-up" transformer.

Core-Type and Shell-Type Transformers.—Transformers are made in two general types; core-type and shell-type. The first construction, the so-called core-type, is shown in Fig. 2. The primary and secondary windings surround the core, and are placed as close as possible to each other in order to obtain the most effective inductive action and to minimize the magnetic leakage. A shell-type transformer is one in which the iron core surrounds the coils as shown in Fig. 3. The de-

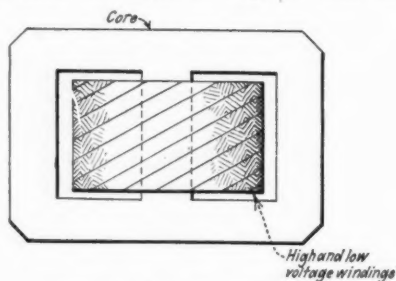


Fig. 3—Shell-Type Construction

Note that the iron core mostly surrounds the coils. The theory of operation is the same as for the core-type transformer and the windings are generally built in sections laid close to each other.

tails of construction are very similar to the core-type transformer. Electrically the two types are the same, the difference being merely in the mechanical construction. Both types are generally made by all manufacturers.

It will be noted in most diagrams representing transformers that one winding is shown as a coil of many turns of fine wire and the other as a coil of fewer turns of coarse wire. This is because a certain amount of power at high voltage and low current would require a small wire, while the same amount of power at low voltage would necessarily be of high current value and require a relatively larger wire.

The cores of transformers are made of thin sheets of special non-ageing iron cut to shape and stacked together. This is necessary to keep the transformer losses as low as possible. The rapidly reversing magnetic flux in the core produces both a hysteresis and eddy-current loss which is large or small depending upon the kind of iron and thickness of the laminations.

Methods of Cooling.—Depending upon the type, kind, size and service a transformer may be cooled by natural radiation, oil, water or air blast. Metering transformers and transformers used for short intervals of time such as motor starting transformers are often cooled by natural radiation. Most all other transformers are immersed in oil which dissipates the heat or is assisted by water-cooled coils near the surface of the oil. Air-blast cooled transformers are only feasible in central and substation practice where a suitable air-blast fan can be installed.

Don't Lengthen Your Wrench

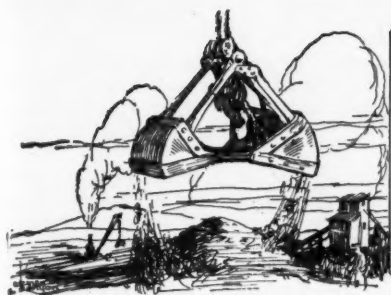
I have several times seen in print the kink which shows how to make a wrench longer by "slipping a gas pipe over the handle." It is a simple procedure, and it may look and sound good to some, but I don't believe in making a wrench longer in order to tighten nuts.

Wrenches for small nuts are invariably short; for medium nuts, medium in length; and for large nuts, they are long. The manufacturers have some system in making wrenches. The pitch of the thread, the cross-sectional area of the bolt at the bottom of the threads and the strength of the man who does the tightening are all considered in the design of the wrench.

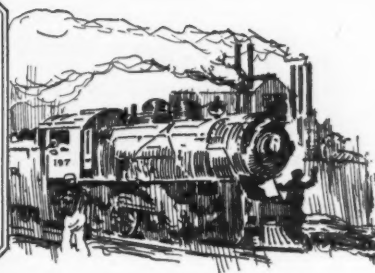
By making a wrench twice as long you therefore double the twist on the bolt when the pull on the wrench is the same. By increasing wrench lengths I have frequently actually stretched bolts until they broke in two, unless I stopped turning as soon as I thought the bolt was beginning to stretch. This is poor practice, and I do not do it any more. I do not increase the length of the handle because I realize that the elastic limit of a bolt should never be reached.

If you feel like making a wrench longer for unscrewing a nut do so. But don't make it longer for tightening.

W. F. SCHAPHORST



Production And the Market



Bituminous-Coal Trade Begins to Take Hope As General Business Shows Signs of Upturn

Straws showing which way the zephyrs are headed are to be seen in the heavier dumpings at Hampton Roads and at the Lakes as well as in the increased movement to tidewater at New York. The increases do not amount to much in themselves, but as premonitory symptoms of the long-awaited turn for the better in the coal business they are fraught with far-reaching interest. As during the nationwide depression of the last few months, the coal situation reflects general business conditions, which are reported to be gradually improving. There has been no change in the textile and shoe industries, which are at an extremely low ebb, but a turn for the better in the steel trade is looked for soon. A prominent coal operator predicts an increase in coal production within thirty days, saying there will be a spurt after July 1 to replenish dwindling stockpiles, which are nearing the danger line.

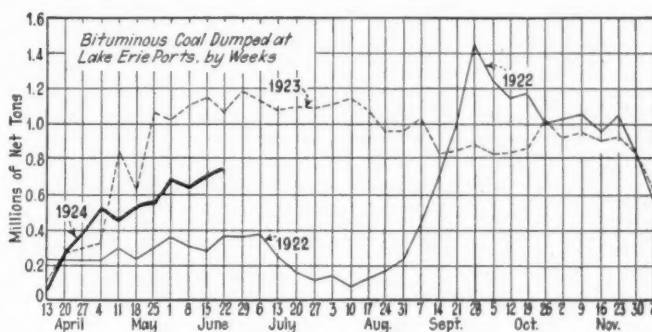
Bureau of Mines Places Orders

The U. S. Bureau of Mines has awarded a contract for 54,000 tons of New River run of mine coal, to be delivered to the Government Fuel Yards, at \$2.19 per ton. Contracts for several small lots of anthracite, totaling 14,990 tons, also have been let.

Coal Age Index of spot prices of bituminous coal failed to register any change during the week, standing at 166 on June 23, the corresponding price being \$2.01, the same as on June 16.

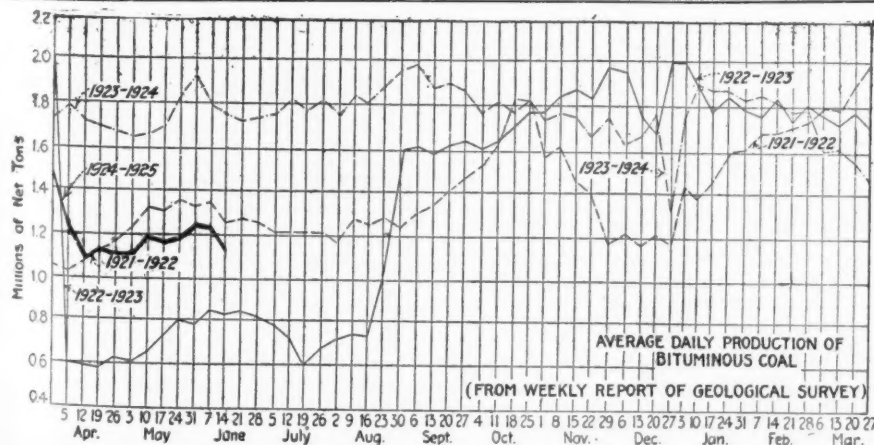
There was a pronounced pick-up in activity at Hampton Roads, dumpings of coal for all accounts during the week ended June 21 totaling 350,821 net tons, as compared with 265,222 tons during the preceding week. Coal dumped at Lake Erie ports during the week ended June 21, according to the Ore & Coal Exchange, was as follows: Cargo, 699,519 net tons; fuel, 41,168 tons. The previous week's figures were 645,978 tons of cargo coal and 39,184 tons of fuel coal.

Production of bituminous coal again took a tumble during the week ended June 14, the upturn of the preceding week proving to have been only a post-holiday spurt. Output for the week ended June 14, according to the Geological Survey, was 6,999,000 net tons, a decrease of 374,000 tons from the week before. Nevertheless, there has been a tendency toward a gradual increase in the rate of output since April 12, and the Geological Survey reports that telegraphic returns of car loadings for June 16 and 17 indicate the probable continuance of this slow recovery. Anthracite produc-



tion also declined slightly, the output for the week ended June 14 being 1,823,000 net tons, compared with 1,846,000 tons during the previous week.

Activity in anthracite continues to taper off steadily. Demand is gradually but surely slowing down, consumers showing a disposition to hold out for the particular size they want and refusing a mixture of chestnut in order to obtain stove. Demand is still far the strongest for stove, though there is a fair call for egg. The movement of pea has slowed down to such an extent that some operators are reported to be storing it in large quantities.



Estimates of Production

(In Net Tons)

BITUMINOUS

	1923	1924
May 31	10,091,000	6,708,000
June 7 (a)	10,676,000	7,373,000
June 14 (b)	10,373,000	6,999,000
Daily average	1,762,000	1,167,000
Cal. yr. to date (c) ..	249,931,000	211,490,000
Daily average to date ..	1,773,000	1,501,000

ANTHRACITE

May 31	1,606,000	1,294,000
June 7	2,046,000	1,846,000
June 14	2,053,000	1,823,000
Cal. yr. to date	47,245,000	41,885,000

COKE

June 7	405,000	150,000
June 14	406,000	131,000
Cal. yr. to date (c) ..	9,205,000	5,827,000

(a) Revised from last report. (b) Subject to revision. (c) Minus one day's production to equalize number of days in the two years.

Midwest Hunts Market

The deadly dullness shows no new signs of brightening. The scattering inquiries of a week ago continue to come in, thus giving some encouragement to an otherwise sluggish trade, but little business is developing out of it and none is expected now for a few weeks. However, the trade is not so much pessimistic as it is callous to hard going. From now on, any change will be for the better. Heat waves sweeping the middle belt of the nation have killed retail business and few yards are stocking with Midwest coals. There is a little constant business for eastern Kentucky and smokeless coals among such buyers.

Steam trade is slower. For the first time screenings "no bills" are beginning to accumulate at some of the mines of Illinois and Indiana. This aggravates the tendency to lower steam prices which began last week. Little southern Illinois fine stuff brings more than \$1.90 and most of it is clear down to \$1.75. Fourth Vein Indiana is at the same level. Fifth Vein and central Illinois screenings range from \$1.50 to \$1.65 with emphasis on the low figure.

The Illinois fields show no improvement in running time. Crushers are busy making small coal out of large. Commercial mines hardly ever get more than two days' work a week. Railroad tonnage generally is light in the southern

Illinois regions but continues moving slowly in the Mt. Olive territory. Standard district mines are hardly able to sell anything. The region is full of empty storage cars and a good many "no bills." Little smoke rises from mine plants.

Business is practically at a standstill in St. Louis. No domestic coal is moving except for current needs and that is small. Storage does not seem to have begun. Dealers' yards are well filled with everything. Both wagonload and carload steam business has stopped. Country domestic shows a little activity but it is hard to find, and country steam, which was active two weeks ago, has eased up. There are no changes in prices.

Kentucky Foresees Stocking Demand

The feeling in the Kentucky coal trade is somewhat better than it has been, as it is felt that the worst of the dull season is past and that normal summer stocking will now create a demand for coal. Domestic sizes are moving better, and this with Lake business is resulting in better production of screenings and slight weakness in the market for those sizes. This should influence some of the big steam consumers to place orders. In eastern Kentucky screenings are selling at from 85c. @ \$1.15, as against \$1.25 @ \$1.50 in western Kentucky.

Current Quotations—Spot Prices, Bituminous Coal—Net Tons, F.O.B. Mines

Low-Volatile, Eastern		Market Quoted	June 25 1923	June 9 1924	June 16 1924	June 23 1924†	Midwest		Market Quoted	June 25 1923	June 9 1924	June 16 1924	June 23 1924†
Smokeless lump.....	Columbus....		\$6.10	\$3.50	\$3.65	\$3.75@ \$4.00	Franklin, Ill. lump.....	Chicago.....		\$4.05	\$2.85	\$2.75	\$2.50@ \$3.00
Smokeless mine run.....	Columbus....		3.60	2.30	2.30	<i>2.10@ 2.35</i>	Franklin, Ill. mine run.....	Chicago.....		3.10	2.35	2.35	2.25@ 2.50
Smokeless screenings.....	Columbus....		3.60	1.85	1.25	1.10@ 1.50	Franklin, Ill. screenings....	Chicago.....		1.80	2.00	1.90	1.75@ 1.90
Smokeless lump.....	Chicago.....		6.10	3.35	3.60	3.50@ 3.75	Central, Ill. lump.....	Chicago.....		2.60	2.35	2.35	2.25@ 2.50
Smokeless mine run.....	Chicago.....		3.85	2.00	2.00	2.00	Central, Ill. mine run.....	Chicago.....		2.10	2.10	2.10	2.00@ 2.25
Smokeless lump.....	Cincinnati....		6.00	3.60	3.75	3.75@ 4.00	Central, Ill. screenings....	Chicago.....		1.60	1.60	1.60	1.50@ 1.65
Smokeless mine run.....	Cincinnati....		3.50	2.10	1.85	1.75@ 2.00	Ind. 4th Vein lump.....	Chicago.....		3.35	2.85	2.75	2.75@ 3.00
Smokeless screenings.....	Cincinnati....		3.25	1.50	1.50	<i>1.35@ 1.65</i>	Ind. 4th Vein mine run.....	Chicago.....		2.60	2.35	2.35	2.25@ 2.50
*Smokeless mine run.....	Boston.....		5.60	4.40	4.30	4.25@ 4.40	Ind. 4th Vein screenings....	Chicago.....		1.80	1.95	1.80	1.75@ 1.90
Clearfield mine run.....	Boston.....		2.35	2.00	2.00	1.65@ 2.40	Ind. 5th Vein lump.....	Chicago.....		2.85	2.35	2.35	2.25@ 2.50
Cambria mine run.....	Boston.....		2.85	2.35	2.45	2.15@ 2.75	Ind. 5th Vein mine run.....	Chicago.....		2.10	2.10	2.10	2.00@ 2.25
Somerset mine run.....	Boston.....		2.60	2.15	2.15	1.85@ 2.50	Ind. 5th Vein screenings....	Chicago.....		1.55	1.60	1.60	1.50@ 1.75
Pool 1 (Navy Standard).....	New York.....		3.75	2.65	2.70	2.50@ 2.90	Mt. Olive lump.....	St. Louis.....		2.85	2.85	2.85	2.75@ 3.00
Pool 1 (Navy Standard).....	Philadelphia..		3.65	3.00	3.00	2.75@ 3.25	Mt. Olive mine run.....	St. Louis.....		2.50	2.50	2.50	2.50
Pool 1 (Navy Standard).....	Baltimore....						Mt. Olive screenings....	St. Louis.....		2.00	2.00	2.00	2.00
Pool 9 (Super. Low Vol.).....	New York.....		2.75	2.20	2.20	2.00@ 2.40	Standard lump.....	St. Louis.....		2.25	2.15	2.15	2.00@ 2.35
Pool 9 (Super. Low Vol.).....	Philadelphia..		2.85	2.20	2.20	2.00@ 2.45	Standard mine run.....	St. Louis.....		1.75	1.80	1.80	1.75@ 1.85
Pool 9 (Super. Low Vol.).....	Baltimore....		2.75	1.85	1.85	1.80@ 1.90	Standard screenings....	St. Louis.....		1.35	1.60	1.50	1.40@ 1.60
Pool 10 (H.Gr. Low Vol.).....	New York.....		2.50	1.85	1.85	1.75@ 2.00	West Ky. lump.....	Louisville....		2.25	2.00	2.05	1.90@ 2.15
Pool 10 (H.Gr. Low Vol.).....	Philadelphia..		2.25	1.85	1.85	1.70@ 2.00	West Ky. mine run.....	Louisville....		1.75	1.55	1.50	1.35@ 1.75
Pool 10 (H.Gr. Low Vol.).....	Baltimore....		2.45	1.65	1.65	1.60@ 1.70	West Ky. screenings....	Louisville....		1.15	1.55	1.50	1.40@ 1.75
Pool 11 (Low Vol.).....	New York.....		1.95	1.60	1.60	1.50@ 1.75	West Ky. lump.....	Chicago.....		2.35	1.85	2.00	1.75@ 2.00
Pool 11 (Low Vol.).....	Philadelphia..		1.90	1.50	1.50	1.30@ 1.70	West Ky. mine run.....	Chicago.....		1.45	1.60	1.50	1.50@ 1.75
Pool 11 (Low Vol.).....	Baltimore....		2.25	1.55	1.55	1.50@ 1.60							

High-Volatile, Eastern		Market Quoted	June 25 1923	June 9 1924	June 16 1924	June 23 1924†	South and Southwest		Market Quoted	June 25 1923	June 9 1924	June 16 1924	June 23 1924†
Pool 54-64 (Gas and St.).....	New York.....		1.80	1.50	1.50	1.40@ 1.65	Big Seam lump.....	Birmingham..		3.05	3.00	3.00	2.90@ 3.10
Pool 54-64 (Gas and St.).....	Philadelphia..		1.70	1.55	1.55	1.45@ 1.70	Big Seam mine run.....	Birmingham..		2.05	1.85	1.85	1.75@ 2.10
Pool 54-64 (Gas and St.).....	Baltimore....		1.75	1.50	1.50	1.40@ 1.65	Big Seam (washed).....	Birmingham..		2.35	2.00	2.00	1.75@ 2.25
Pittsburgh se'd gas.....	Pittsburgh....		2.80	2.40	2.40	2.30@ 2.50	S. E. Ky. lump.....	Chicago.....		3.25	2.10	2.10	2.00@ 2.25
Pittsburgh gas mine run.....	Pittsburgh....			2.10	2.10	2.00@ 2.25	S. E. Ky. mine run.....	Chicago.....		2.35	1.60	1.50	1.25@ 2.00
Pittsburgh mine run (St.).....	Pittsburgh....		2.05	1.85	1.85	1.75@ 2.00	S. E. Ky. lump.....	Louisville....		3.35	2.10	2.10	2.00@ 2.25
Pittsburgh slack (Gas).....	Pittsburgh....		1.50	1.35	1.35	1.20@ 1.25	S. E. Ky. mine run.....	Louisville....		2.10	1.50	1.55	1.25@ 1.75
Kanawha lump.....	Columbus....		3.00				S. E. Ky. screenings....	Louisville....		1.35	.95	1.05	<i>80@ 1.15</i>
Kanawha mine run.....	Columbus....		1.85				S. E. Ky. lump.....	Cincinnati..		3.25	2.35	2.25	2.25@ 2.75
Kanawha screenings.....	Columbus....		1.35				S. E. Ky. mine run.....	Cincinnati..		1.60	1.45	1.50	1.25@ 1.65
W. Va. lump.....	Cincinnati..		3.25	2.10	2.25	2.00@ 2.50	S. E. Ky. screenings....	Cincinnati..		1.10	.90	.85	.75@ 1.10
W. Va. gas mine run.....	Cincinnati..		1.75	1.35	1.35	1.25@ 1.50	Kansas lump.....	Kansas City..		4.00	4.50	4.50	4.50
W. Va. steam mine run.....	Cincinnati..		1.75	1.35	1.35	1.25@ 1.50	Kansas mine run.....	Kansas City..		3.25	3.50	3.50	3.50
W. Va. screenings.....	Cincinnati..		1.10	.85	.85	85@ 1.00	Kansas screenings....	Kansas City..		2.60	2.50	2.50	2.50
Hooking lump.....	Columbus....		2.75	2.40	2.45	2.25@ 2.65							
Hooking mine run.....	Columbus....		1.85	1.70	1.70	1.60@ 1.85							
Hooking screenings.....	Columbus....		1.20	1.40	1.35	1.30@ 1.45							
Pitts. No. 8 lump.....	Cleveland....		2.70	2.45	2.40	<i>2.00@ 2.75</i>							
Pitts. No. 8 mine run.....	Cleveland....		1.90	1.85	1.85	1.80@ 1.90							
Pitts. No. 8 screenings....	Cleveland....		1.25	1.20	1.15	<i>1.05@ 1.15</i>							

* Gross tons, f.o.b. vessel, Hampton Roads.

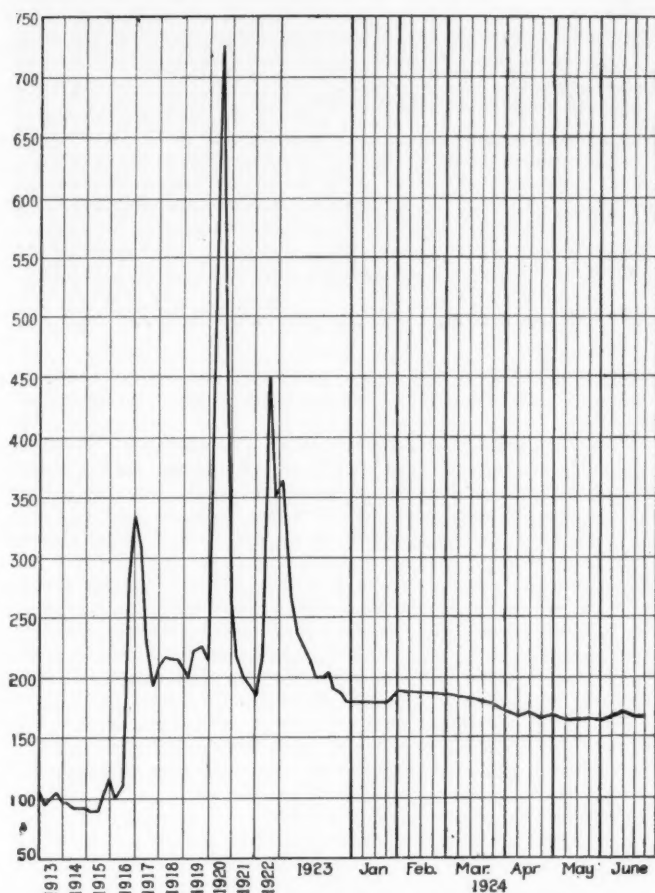
† Advances over previous week shown in heavy type, declines in italics.

‡ On strike.

Current Quotations—Spot Prices, Anthracite—Gross Tons, F.O.B. Mines

		Market Quoted	Freight Rates	June 25, 1923		June 16, 1924		June 23, 1924†	
				Independent	Company	Independent	Company	Independent	Company
Broken.....	New York.....		\$2.34		\$7.75@ \$8.35		\$8.00@ \$8.85		\$8.00@ \$8.85
Broken.....	Philadelphia..		2.39		7.00@ 8.10		8.70@ 8.85		8.70@ 8.85
Egg.....	New York.....		2.34	\$8.50@ \$11.50	8.00@ 8.35	\$8.75@ \$9.25	8.45@ 8.85	\$8.75@ \$9.25	8.45@ 8.85
Egg.....	Philadelphia..		2.39	9.25@ 10.50	8.10@ 8.35	8.80@ 9.60	8.80@ 8.85	8.80@ 9.60	8.80@ 8.80
Egg.....	Chicago.....		5.06	7.60@ 10.25	7.25@ 7.45	7.86@ 8.00	7.83@ 7.90	7.86@ 8.00	7.83@ 7.90
Stove.....	New York.....		2.34	8.50@ 11.50	8.00@ 8.35	9.00@ 9.25	8.45@ 9.10	9.00@ 9.25	8.45@ 9.10
Stove.....	Philadelphia..		2.39	9.25@ 10.00	8.15@ 8.35	9.15@ 9.80	8.85@ 9.00	9.15@ 9.80	8.85@ 9.03
Stove.....	Chicago.....		5.06	7.60@ 10.25	7.25@ 7.45	8.17@ 8.30	8.13@ 8.23	8.17@ 8.30	8.13@ 8.25
Chestnut.....	New York.....		2.34	8.50@ 11.00	8.00@ 8.35	8.75@ 9.25	8.45@ 8.95	8.75@ 9.25	8.45@ 8.95
Chestnut.....	Philadelphia..		2.39	9.25@ 10.50	8.15@ 8.35	8.85@ 9.70	8.80@ 8.85	8.85@ 9.70	8.80@ 8.85
Chestnut.....	Chicago.....		5.06	7.60@ 10.25	7.25@ 7.45	8.00@ 8.13	8.08@ 8.13	8.00@ 8.13	8.08@ 8.13
Range.....	New York.....		2.34		8.30		8.70		8.70
Pea.....	New York.....		2.22	7.25@ 8.00	6.00@ 6.30	5.00@ 5.50	5.50@ 6.00	5.00@ 5.50	5.50@ 6.00
Pea.....	Philadelphia..		2.14	7.00@ 7.25	6.15@ 6.20	5.75@ 6.25	5.75@ 6.00	5.75@ 6.25	5.75@ 6.00
Pea.....	Chicago.....		4.79	6.25@ 7.25	5.50@ 5.65	5.13@ 5.45	5.36@ 5.91	5.13@ 5.45	5.36@ 5.91
Buckwheat No. 1.....	New York.....		2.22	2.75@ 3.50	3.50@ 4.15	2.15@ 3.00	3.00@ 3.15	2.15@ 2.75	3.00@ 3.15
Buckwheat No. 1.....	Philadelphia..		2.14	2.75@ 3.50	3.50	2.50@ 3.00	3.00	2.50@ 3.00	3.00
Rice.....	New York.....		2.22	2.00@ 2.50	2.50	1.75@ 2.25	2.25	1.75@ 2.15	2.25
Rice.....	Philadelphia..		2.14	1.75@ 2.50	2.50	2.00@ 2.25	2.25	2.00@ 2.25	2.25
Barley.....	New York.....		2.22	1.25@ 1.50	1.50	1.25@ 1.50	1.50	1.15@ 1.60	1.50
Barley.....	Philadelphia..		2.14	1.15@ 1.50	1.50	1.50	1.50	1.50	1.50
Birdseye.....	New York.....		2.22		1.60		1.60		1.60

* Net tons, f.o.b. mines. † Advances over previous week shown in heavy type, declines in italics.



Coal Age Index of Spot Prices of Bituminous Coal F.O.B. Mines

	1924			1923
	June 23	June 16	June 9	June 25
Index	166	166	170	205
Weighted average price	\$2.01	\$2.01	\$2.06	\$2.49

This diagram shows the relative, not the actual, prices on fourteen coals, representative of nearly 90 per cent of the bituminous output of the United States weighted first with respect to the proportions each of slack, prepared and run-of-mine normally shipped, and second, with respect to the tonnage of each normally produced. The average thus obtained was compared with the average for the twelve months ended June, 1914, as 100, after the manner adopted in the report on "Prices of Coal and Coke, 1913-1918," published by the Geological Survey and the War Industries Board.

Prepared prices are very steady at from around \$1.75 for egg to a peak price of \$2.75 for best 4-in. block in eastern Kentucky. Eastern Kentucky mine run is steady at \$1.35 @ \$1.75. Other than a little weakness in western Kentucky screenings, prices have been very firm throughout the Kentucky coal fields over the week, eastern Kentucky having lost 5c. or so from the low on screenings.

Southern West Virginia mines are now producing as much tonnage as they sometimes do under more favorable market conditions. There has not been any further increase in the high-volatile output and yet about 600,000 tons per week is coming from the mines, more than half of which is originating in the Logan district. Shipments from Logan to the lakes is unusually large. Comparatively little high volatile is being consigned to Eastern markets owing to the extremely low prices prevailing in that section of the country. There is a little more mining activity in the smokeless area, the average working time being around three days a week.

Prices Drop at Duluth

Trade at the Head-of-the-Lakes is virtually at a standstill, with the railroads supplying some of the activity in out shipments, and a few small orders from industrial concerns which are buying from hand to mouth supplying the balance. Arrivals keep up to the mark, however, with 21 cargoes landed during the week, of which two were hard coal. It is estimated that this market will be strong in hard coal this year and that 1,400,000 tons will be needed to meet the demand. Of this only about 65,000 tons has been brought up so far. The Steel Corporation is moving coal up again, which is a good omen.

Prices have taken a tumble in bituminous as shown in this circular list: Kentucky lump, \$6.25; run of pile, \$5.75; screenings, \$4.25; Youghiogheny lump, \$5.75; run of pile, \$5; screenings, \$3.75 @ \$4; Hocking lump, \$5.50; run of pile, \$4.75; screenings, \$3.75; splint lump, \$5.50 @ \$5.75; run of pile, \$5; screenings, \$4; Pocahontas lump, \$7; run of pile, \$5.50; screenings, \$4.50.

The only sign of real life in the market is the bidding which is being done for municipal contracts among the towns of the iron ranges. It is asserted that docks are sticking fairly close to prices in this.

Summer dullness pervades the Milwaukee coal market. Retailers profited in a small way by prolonged wet and cool weather, but everything is quiet now. There is little doing in the wholesale trade. The soft-coal market is weak. The regular price of Youghiogheny pile run, f.o.b. car or truck, is \$6 a ton. The United Coal & Dock Co., however, is delivering 2,000 tons of this coal to a Milwaukee institution at \$4.49. Other bids ranged from this price up to \$5.31 per ton. Last year the county paid \$6.19 for the same coal. Oil is affecting the anthracite trade quite seriously. June witnessed quite a spurt in receipts by lake, but midsummer promises to be slow in this respect. Receipts of anthracite for the season aggregate 210,398 tons, and of soft coal 474,420 tons.

Western Business Is Slim

Little activity is reported through the Southwest. Domestic storage, principally of Arkansas semi-anthracite, has started, but is slow. There has been a steady increase in the pre-season demand for threshing coal. The industrial demand remains quiet. Retailers are making a storage price of \$10.85 on Arkansas semi-anthracite lump, from \$2 to \$2.50 below the regular midwinter price.

The demand for Colorado coal continues very quiet with mines working two or three days a week, which, in the opinion of the operators, is hardly worth while. Although many of the smaller mines have been closed entirely, very little improvement is shown in the production of the others. Operators report 42 per cent of the working time lost last week on account of no market. Prices are unchanged.

Mines in Utah are working less than two days a week. The demand, such as it is, is for intermediate sizes. The sugar industry is storing a little slack coal, however. There is no contracting right now, but a few bids have been published. It is thought that screened slack will soon be off the market as a result of the new mine regulations, which will make it difficult to get this grade hereafter. Price cutting is reported, especially on slack coal, which is said to be selling as low as 90c., though \$1.25 is supposed to be the price.

Cincinnati Sees Cheering Signs

Better demand for bituminous nut and slack was the high point of Cincinnati market this week. Inquiry and orders came largely from industrial plants, some of which had been out of the market off and on for several months. Lump and block business has slowed down considerably, due in great measure to the torrid days that have set in and inability to get raw labor to handle the shipments to the smaller places. In the smokeless line-up the principal cause for comment is the strength of prepared and the weakness of the residue. The undertone is better, the belief being that the worst of the situation has been seen. River business, because of the excellent stage, is good. Retail prices show no change.

The trade at Columbus continues quiet, but some producers and shippers profess to see signs of improvement. Signs of a better demand from retailers are apparent and buying is slightly heavier. Householders show a preference for Pocahontas, splints and Kentucky grades, although some Hocking and Pomeroy lump is moving. Steam business is rather quiet with prices low and irregular. Utilities and railroads probably are the best customers now, although iron and steel concerns also are buying to a small extent. School coal is moving in good quantities. Contracting is quiet, as most users are content to buy on the open market in preference to renewing contracts. Demurrage coal is not so common since many of the larger mines have closed down. Loading of bottoms at the lower lake ports is rather brisk, but Kentucky and West Virginia are getting the business.

Shippers to the Cleveland market are pessimistic, believing the hoped-for upturn still distant. Prices have eased off a trifle further, the general tendency being weaker. No doubt this is due to the tapering off of industrial and manufacturing activity and a tepid demand for Lake cargo coal. Distress coal arriving at industrial centers unconsigned is being disposed of in small lots at 5c. to 10c. under the market to avoid demurrage charges.

Consumption of coal at Pittsburgh continues to trend downward, both on the railroads and in the industries. The steel industry, however, probably is not far from its turning point now. There is no change in quotations except that slack is down about 10c. for both steam and gas.

The trade at Buffalo is quite as dull as ever. The offices of operators whose mines are shut down are little now but hanging-out places, unless they go into the jobbing trade, which some of them have not done. The general slowing down of business has given the coal trade a second downward turn.

Better Undertone in New England

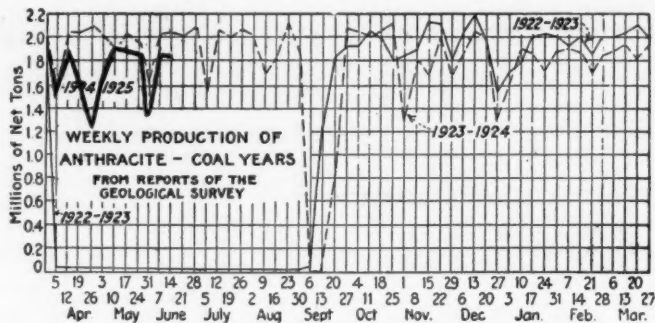
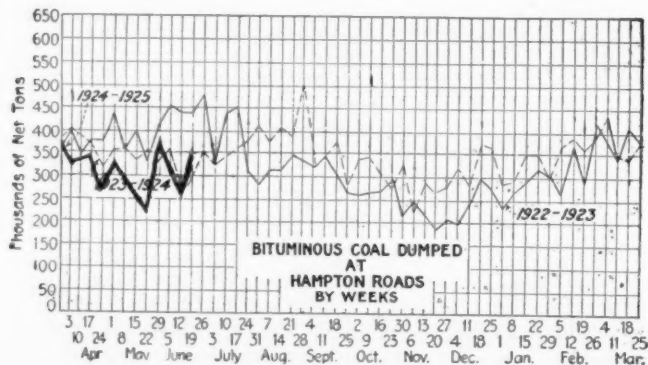
While there is no marked improvement in New England trade there is perhaps a less unsatisfactory undertone than a fortnight ago. Prices are reasonably well maintained at the levels quoted last week and there is less shading of spot quotations. There are of course as yet no signs of comprehensive buying, but current inquiry is being closely watched and especially for inland delivery from rehandling wharves at this end there is a disposition to net more money the moment the situation warrants. It is noticed, too, that all-rail coals are in somewhat better request in the territory where they are accessible in competition with Pocahontas and New River.

At Hampton Roads the No. 1 grades are being held at \$4.25@\$4.40 per gross ton f.o.b. vessel, and here too there are fewer indications of price shading. Smokeless coal of No. 2 grade is still to be had at levels down to \$4, but accumulations are less heavy and output generally is being rigidly curtailed. There is enough tonnage applying on contracts and on purchases offshore to take care of a fairly good proportion of the Pocahontas and New River now being mined.

For distribution at Boston, Providence and Portland prices are still nominally \$5.75 per gross ton on cars; \$5.50 coal is less heard from and there are more quotations of \$5.65 than has hitherto been the rule. This situation naturally improves the prospect for higher grade coals all rail from central Pennsylvania and there have been several instances lately where rail coal has been sold in areas that have been regarded this season up to now as practically closed to the rail route. In this quarter also there is an inclination to advance prices mildly, although as yet not more than 5c. or 10c. more has been paid even on the choicest grade.

Outlook Brighter on Atlantic Seaboard

While no one is willing to admit that business shows a slight improvement the fact remains that shipments of soft coal to the New York tidewater during the past week show an improvement. Receipts for the first five days of the week indicated a daily average of about 1,500 cars whereas for the past few weeks the average has been between 1,300 and 1,400 cars. No one would give an opinion as to why the extra shipments were made in view of the low prices prevailing. There is a better feeling, however, and, while the order books do not show it, the outlook is becoming brighter. Consumers continue to use their re-



serves rather than follow the advice of the federal authorities and railroad officials to stock up before the fall rush begins.

Calm has overspread the trade in Philadelphia. Rumors of strikes in regions where efforts are being made to cut the union scale, it was thought, might spur consumers into buying coal, but so many of them are now contending with poor business prospects that they pay scant attention to their coal supply. Prices remain firm.

A renewal, in some measure at least, of the export movement, along with the announcement that a fair number of charters are now being made for loadings over the end of June and the first part of July, is probably the most encouraging feature of the situation at Baltimore. Local demand is confined almost entirely to small immediate needs. The city government plans the substitution of lump bituminous for anthracite in school houses, fire department houses and other city buildings now being heated by anthracite.

The Birmingham market continues to be much depressed and no indications of improvement are in sight. Slowing down in operations at industrial plants throughout the territory has caused a restricted demand for steam coal in the spot market, and sales agencies and operators are receiving requests to defer regular shipments against contracts. Production is being gradually decreased to accommodate the dull market.

Anthracite Market Still Losing Zip

Stove coal continues to hold the other domestic sizes of anthracite in line at New York, thereby preventing a marked drop in independent quotations. Demand centers almost entirely around stove size, although there is a fair demand for egg. Movement of hard coal is slowing gradually. Demand is much slower, and consumers are maintaining an attitude of demanding the size wanted and of refusing to take a mixture of stove and chestnut when the former coal is wanted. Chestnut is the longest of the three sizes and is quoted at lower figures than either egg or stove when taken alone. Egg coal brings a better price when it is not taken in conjunction with chestnut, which is not in good standing in the New York market. Pea moves slowly. There is a lull in the demand and some operators are reported as storing heavy tonnages. Demand for the steam sizes has slackened considerably. Only the better grades of independent No. 1 buckwheat are bringing full company circular, the average maximum hanging around \$2.75. Rice and barley are in better movement.

At Philadelphia the hard-coal trade has slowed down to a marked degree with the appearance of the first warm weather. Ordering has almost ceased and the public has quickly lost interest in coal. Stove and egg are most in demand, but much of the edge has been worn off these sizes. There are numerous dealers who want more of this coal, but balk at taking nut and pea to get it.

Despite a well organized campaign on the part of a number of Baltimore dealers to induce customers to place orders early, there has been no general response. The fact that the public is fairly well acquainted with the virtual certainty of a retail increase on July 1 seems to have but little effect.

Car Loadings

	Cars Loaded	
	All Cars	Coal Cars
Week ended June 7, 1924	910,707	143,353
Previous week	819,904	120,215
Week ended June 9, 1923	1,012,312	189,765

Foreign Market And Export News

British Coal Market Reviving Slowly; Output Slips Further

The British coal markets are gradually reviving from the usual depression that accompanies the holidays, but new business is scarce. Quoted prices are being shaded in some instances to obtain orders. It is reported that German and American competition is keener. The South Wales market reflects a slight improvement in demand. Exports are expanding and the attempts of foreign buyers to depress prices are not meeting with success. Notices of approaching shutdowns have been posted at additional pits as a result of the unremunerative operating conditions.

A cable to *Coal Age* states that the production by British collieries during the week ended June 7 was 5,120,000 tons, according to the official reports. This compares with an output of 5,308,000 tons during the week ended May 31.

House Trade Dull, Industrial Demand Normal in France

Business in household coal in the French market is dull. Activity in industrial fuels, however, is normal and satisfactory, but there is no rush on the market and deliveries are quite regular. Increased output from the devastated collieries is being placed without difficulty.

In the import field there is much surprise in seeing prices raised at the British shipping docks at the same time that the pound is rising; ordinarily French dealers expect some compensation. Owing to the unsteadiness of exchange, there is much hesitation in the purchase of British coals. However, some exporters are making offers in pounds based on a certain rate and provide in their contracts a stated difference per ton applicable per point of increase in the value of sterling on receipt of the order.

From Belgium deliveries are plenti-

ful and the transportation problem seems less acute because shipments are less abundant.

Deliveries of indemnity fuels remain weak as compared to the tonnages received before the strike. During the first seventeen days of May, France and Luxemburg received 156,700 tons of coal, 248,100 tons of coke and 15,770 tons of lignite briquets, a total of 420,620 tons, or a daily average of about 24,800 tons. Although no statistics have been given out on the amount of fuel received during the last days in May, the deliveries are said to have fallen off. It is hoped, however, that they will soon improve with the gradual resumption of work in the Ruhr mines. But, as the amount of fuel that should have been delivered to the Allies has not been received, the Reparation Commission has seized stocks at the mines.

The Dusseldorf agreements having expired on June 15, negotiations will be started as soon as the new French Ministry for Public Works is appointed.

Hampton Roads Sees No Let-Up In Dullness

Dullness continues to feature the market at Hampton Roads, with supplies at tidewater dwindling but with the price level holding steady. A large contract for South American shipment has been wound up, leaving the foreign movement outlook unpromising. Coastwise movement is only fair, while the bunker trade is holding its own.

Washouts on the Virginian Ry. have caused a delay of several days in coal movement and have tended to curtail output to some extent, being partly responsible for the low supplies at tide.

The tone of the market is dull and the outlook is described by shippers as not bright, although they had expected a slow spell at this season.

New Coal-Loading Plant at Brazilian Port

Pernambuco, Brazil, is to have a new mechanical coal-loading plant, which will be installed at an expenditure approximating \$287,000. A traveling gantry crane will be used to deliver coal on shipboard by clamshell buckets, or other similar device. A minimum loading capacity of 250 metric tons per hour is contemplated.

Export Clearances, Week Ended June 21, 1924

FROM HAMPTON ROADS	
For Brazil:	Tons
Dan. Str. Denevirke for Santos.....	3,897
Br. Str. Kayeson for Rio de Janeiro....	4,707
Br. Str. Golden Sea for Rio de Janeiro..	6,256
For Chile:	
Dan. Str. Gudrun Maersk for Antofagasta	6,085
For Cuba:	
Br. Str. Mayari for Banes.....	2,237
For France:	
Fr. Str. P.L.M. 24 for Marseilles.....	8,049
For Hawaii:	
Amer. Str. Orinoco for Pearl Harbor....	6,747
For Mexico:	
Nor. Str. Tjorsdal for Puerto Mexico....	3,227
For West Indies:	
Nor. Str. Bjornefjord for Fort de France	5,412
Swed. Str. Ada Gorthon for Curacao.....	3,515

FROM BALTIMORE	
For Canada:	
Amer. Schr. Cora F. Cressy.....	1,205
For Costa Rica:	
Br. Str. North America.....	3,017
For France:	
Belg. Str. Elzasier	7,449
Br. Str. Lancaster Castle	8,085
For Italy:	
Ital. Str. Aster.....	9,155
Br. Str. Lancastrian	3,684
For Porto Rico:	
Am. Str. Major Wheeler.....	391

Hampton Roads Pier Situation

N. & W. Piers, Lamberts Pt.:	June 14	June 21
Cars on hand.....	1,261	327
Tons on hand.....	77,329	22,096
Tons dumped for week.....	73,016	99,561
Tonnage waiting.....	15,000	10,000
Virginian Piers, Sewalls Pt.:		
Cars on hand.....	912	776
Tons on hand.....	70,250	59,400
Tons dumped for week.....	72,535	100,531
Tonnage waiting.....	13,419	12,746
C. & O. piers, Newport News:		
Cars on hand.....	1,405	1,521
Tons on hand.....	72,740	76,735
Tons dumped for week.....	91,255	113,141
Tonnage waiting.....	10,485	7,710

Pier and Bunker Prices, Gross Tons

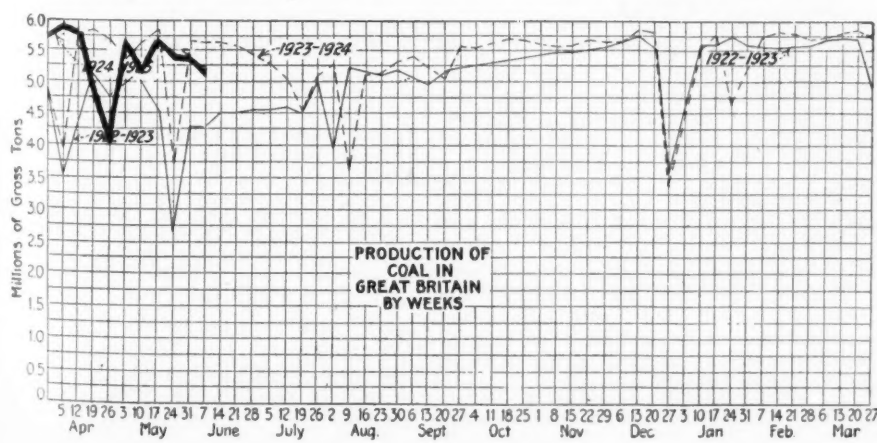
PIERS		June 14	June 21†
Pool 9, New York.....	\$4.85@ \$5.00	\$4.85@ \$5.00	
Pool 10, New York.....	4.60@ 4.75	4.60@ 4.75	
Pool 11, New York.....	4.40@ 4.50	4.40@ 4.50	
Pool 9, Philadelphia.....	4.70@ 5.05	4.70@ 5.05	
Pool 10, Philadelphia.....	4.45@ 4.80	4.45@ 4.80	
Pool 11, Philadelphia.....	4.30@ 4.55	4.30@ 4.55	
Pool 1, Hamp. Roads.....	4.35	4.35	
Pool 2, Hamp. Roads.....	4.25	4.25	
Pools 5-6-7, Hamp. Rds..	4.20	4.10@ 4.15	

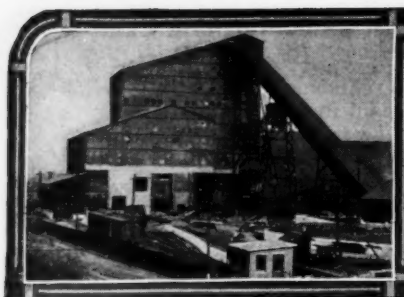
BUNKERS		June 14	June 21†
Pool 9, New York.....	5.15@ 5.30	5.15@ 5.30	
Pool 10, New York.....	4.90@ 5.05	4.80@ 5.05	
Pool 11, New York.....	4.70@ 4.80	4.70@ 4.80	
Pool 9, Philadelphia.....	5.00@ 5.40	5.00@ 5.40	
Pool 10, Philadelphia.....	4.75@ 5.00	4.75@ 5.00	
Pool 11, Philadelphia.....	4.50@ 4.80	4.50@ 4.80	
Pool 1, Hamp. Roads.....	4.40	4.45	
Pool 2, Hamp. Roads.....	4.25	4.35	
Pools 5-6-7, Hamp. Rds..	4.20	4.20	

Current Quotations British Coal f.o.b. Port, Gross Tons

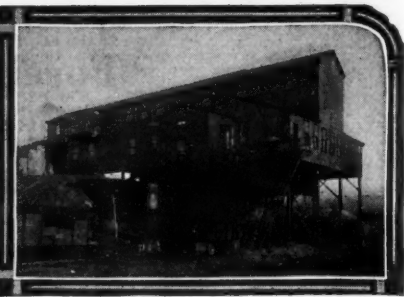
Quotations by Cable to Coal Age		June 14	June 21†
Admiralty, large....	27s. 3d. @ 28s.	27s. 6d. @ 28s.	
Steam smalls.....	18s. 6d.	18s. 6d.	
Newcastle:			
Best steams.....	22s. 6d. @ 23s. 6d.	22s. @ 23s.	
Best gas.....	23s. @ 23s. 6d.	23s. @ 23s. 6d.	
Best bunkers.....	20s. @ 21s.	20s. @ 21s. 6d.	

† Advances over previous week shown in heavy type, declines in italics.





News Items From Field and Trade



ALABAMA

The Alabama Coal & Iron Co. has given an option on 158,000 acres of coal lands in Etowah, Jackson, Marshall, Cherokee and DeKalb Counties to the Jasper Trust Co., of Jasper. The Etowah Investment Co., which owns a large tract of coal lands in the western part of Etowah County, also has given an option on its holdings to the same company. The Jasper Trust Co. is the holding company for the Deepwater Coal & Iron Co., recently organized with a capital stock of \$10,000,000 and with headquarters at Jasper. The company is preparing for the extensive mining of coal at a number of places in northern Alabama.

A new board of state mine examiners has been appointed by Governor Brandon as follows: F. G. Long, Maylene; Sam Y. Leith, Dolomite; C. M. Parker, Newcastle; J. S. Kellum, Boothton; C. E. Bowron, Birmingham, with C. H. Nesbitt, chief mine inspector, as ex-officio chairman. The board will hold an examination of applicants for eligibility as mine foremen and fireboss during the latter part of July, the date not having been fixed as yet.

The Gadsden Coal & Clay Products Co. has been incorporated at Gadsden and will mine coal from a new opening near that point and also will remove a vein of fireclay underlying the coal, the clay to be used in the manufacture of brick. E. N. Smith is president of the company.

COLORADO

Edward H. Denny, formerly of the Bureau of Mines safety section, in Washington, has succeeded Dan Harrington as the bureau's district mining engineer for Colorado, Wyoming and New Mexico. He is already on the job, with headquarters in Denver. Mr. Harrington now lives in Salt Lake City, Utah, and is consulting safety engineer for two Utah coal companies.

CONNECTICUT

The Commonwealth Fuel Co., of Pennsylvania, has been granted \$73,856.65 damages against the Karm Terminal Co., at Bridgeport, one of the largest dealers in coal in Connecticut. Mr. McNeil, of the Karm Terminal Co., has filed notice of appeal.

NEW YORK

W. C. Atwater, president of Wm. C. Atwater & Co., Inc., New York City, has been elected president of the Pocahontas Operators' Association, suc-

ceeding Isaac T. Mann. Mr. Atwater has been in the coal business nearly 30 years, beginning as a salesman in 1886 and taking over a retail yard at Fall River, Mass., two years later. He soon entered the producing field, being first associated with W. D. Ord in the Empire operation and later purchasing the Elkhorn mines at Maybeury. The holdings of the firm of Wm. C. Atwater & Co., established in 1900, now include the Elkhorn operation, the Fall River Coal Co., the Williams-Pocahontas Co. and an interest in the American Coal Co.

The city of Buffalo has given up the use of anthracite for school fuel and asked for bids to furnish 26,000 tons of smokeless bituminous and 10,000 tons of ordinary soft coal. This will provide supply from July to April.

The name of the Maxim Coal & Coke Corporation, Buffalo, has been changed to the McCarthy Coal & Coke Co., a copartnership, with D. J. and F. H. McCarthy owners, L. P. Zimmerman having retired.

The Lehigh Valley Coal Co. in 1923 had a net income of \$5,237,083 after bond, interest and federal taxes, against an average net of \$3,651,935 for the five years to Dec. 31, 1923. This was equal to \$4.32 a share on the 212,160 certificates of interest offered to stockholders of the Lehigh Valley R.R., compared with \$3.01 a share for the five-year period. The company's deduction for bond interest did not include provision for any interest on \$15,000,000 of 5 per cent bonds for the reason that the issue was dated Feb. 1 of this year and did not enter into the financial structure of the company during 1923. Interest on this issue for the eleven months of the current year will be a charge against this year's income.

OHIO

The New Pittsburgh Coal Co., of Columbus, announces that the Minerton mine, in the Pomeroy field, will not be abandoned, as reported, but the tonnage will be run through the tipples of the Thomas mine, which adjoins.

The federal court at Covington, Ky., has named William S. Harmon and Frank L. Stein, both of Columbus, ancillary receivers for the Maynard Coal Co. They had been named by the federal court in Ohio upon the original application. A considerable holding of the company is located in the Hazard field of Kentucky.

One of the few coal saleswomen,

Mrs. G. W. Kuhn, secretary-treasurer of the Big Mountain Coal Co., which has offices in the Hadden-Clinton Bank Building, Columbus, has been on the road at various times this spring and has disposed of quite a tonnage. Recently she made a trip to Toledo, Detroit and Cleveland.

The Marcoll mine of the Maher Collieries Co., near Powhatan, partly completed, was the scene of an explosion June 12, which wrecked the shaft, hurled the mine cage to the level of the surface from the bottom of the 200 ft. shaft and tossed safety doors to earth. There was no one in the mine at the time of the explosion, about half an hour before engineers had planned to enter the mine in order to make a survey. The explosion is believed to have been caused by an accumulation of gas. Not quite a year ago William Maher and his brother, sons of the head of the Maher Collieries Co., of Cleveland, were killed in an explosion in the same mine just as they were preparing to enter the mine after descending to the bottom of the shaft.

As soon as estimates of the amount of coal needed are received, John E. Harper, Director of Public Welfare, will ask the State Purchasing Agent to advertise for bids and the contracts for coal for Ohio state institutions during the next 12 months will be let. The State uses more than 150,000 tons of coal annually, and, following the order of Governor Donahey, all of this is Ohio-mined coal. No coal from out of the state has been purchased in the last two years, and all contracts are let on competitive bidding. It will be impossible to award the contracts before July 1, when the appropriations for the next fiscal year will be available, but Director Harper will have all requisitions in before that date, and there should be no delay in placing the order.

PENNSYLVANIA

The Mather Colliery Co., in Greene County, followed the lead of a number of the large coke region companies and reduced wages last week to the 1917 scale.

Coal mining men of the anthracite region are much interested in the segregation of the Lehigh Valley Coal Co. from Coxes Bros. & Co., which must be effective March 15, 1926. The Coxes lands were operated by the Coxes family for many years, but about twenty years ago the Lehigh Valley took the collieries over. If the Valley loses the Coxes holdings, its operations in the lower

field will be materially reduced. It will have only the Shaft and Hazle mines and part of Stockton, Jeansville and Yorktown, unless it reopens the Humboldt. Shaft colliery is largely dependent upon Coxe coal from the Black Creek Valley and Jeansville takes Coxe coal from Oneida.

W. J. Rainey, Inc., has blown out a few hundred ovens at a number of its Connellsville plants, but is running its mines about full, shipping more coal than heretofore. The H. C. Frick Coke Co. has reduced the running time of some of its plants to four or five days per week.

Union officials of District 7 entertained Thomas Kennedy, president, and James A. Gorman, secretary of the Anthracite Conciliation Board, at a banquet in the Hotel Loughran, Hazleton, on June 11. The honor guests left two days later for Europe, where they will attend the world labor conference.

Separate benefit funds of \$1,000 each have been contributed by the district and the international union of the mine workers to the families of the fourteen mine workers who were killed at the Loomis colliery of the Glen Alden Coal Co., Hanover Township, over a week ago.

The Buckeye Coal Co., subsidiary of the Youngstown Sheet & Tube Co., closed down its Nemacolin mine, at Nemacolin, Greene County, last week. Its Brier Hill operation in Fayette County has been down for some time, so that this company is now entirely idle in this section.

The Crawford Coal & Coke Co., of Connellsville, has enlarged its holdings by the purchase of 70 acres adjoining the present property in Georges township, Fayette County. It is reported that \$140,000 was paid for the tract, which is underlaid with Connellsville coking coal.

More anthracite is being taken from the Lehigh River and the numerous dams throughout the Lehigh Valley this spring than in many years past, owing to the continued high water, which washes the coal down the river from the collieries and culm banks along the different tributaries of the Lehigh River.

For the first time in the history of mining circles in the hard-coal region, representatives of the United Mine Workers a week ago visited the main offices of the Hudson Coal Co. in New York to take up with the president of the company and other company officials grievances presented by the local unions. In the past grievances were adjusted at the Scranton offices of the company.

Nearly a million dollars has been expended on equipment and improvements at the Candlemas colliery of the Haddock Mining Co., at Silver Brook, composed of Scranton and Wilkes-Barre capitalists, in a little less than two years, since a long-term lease was obtained from the Philadelphia & Reading Coal & Iron Co., the Lehigh Valley Coal Co. and the Coxe Estate, on a 300-acre tract. A breaker with a

capacity of 2,500 tons daily is operated by electricity; mine slopes have been put in readiness; ground has been cleared to begin stripping operations on a large scale; five steam air compressors have been installed and nearly 500 men are at work.

William Gilbert, contractor, of Hazleton, has started to drive a slope on the extreme eastern end of the Silver Brook tract, on land near O'Gara's in Quakake, controlled by the Coxe estate. This is among the few remaining tracts that can be classed as virgin coal land. The coal will be mined under a royalty distribution arrangement with the Reading, Lehigh Valley and Coxe interests owners.

While closed down the Buckeye Coal Co., a subsidiary of the Youngstown Sheet & Tube Co., is building at the Nemacolin Mine, in Greene County, a new and permanent steel tippie to replace the temporary wooden one erected when the first shafts were sunk. The company also will install skips for hoisting and is concreting the shaft bottom landing and main entry for a considerable distance therefrom.

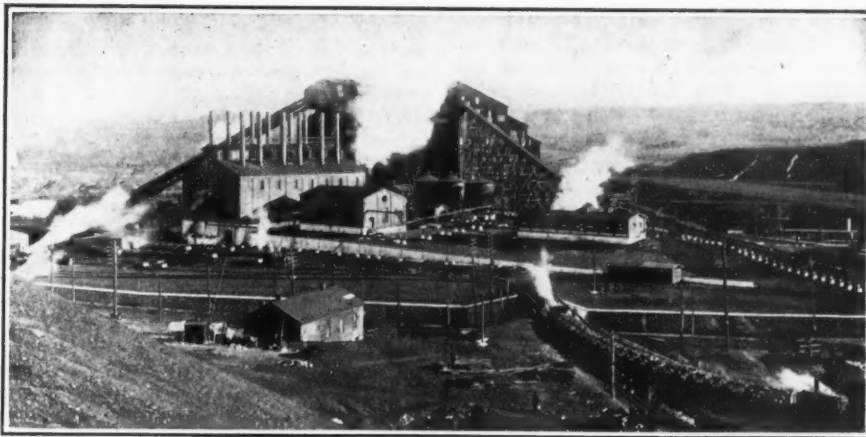
The entire cave area over the workings of the Glen Alden Coal Co. is being equipped with a gas ventilator devised by W. W. Inglis, president of the company, to carry off gas. The ventilator is an arrangement of a terra cotta pipe placed over the service gas pipes of all houses in the district where settlement of the service mains might occur. Escaping gas generally follows the pipes and by placing a vent some distance from the houses in the district, it is declared, the gas will come to the surface instead of continuing into the homes.

Most of the fatal roof fall accidents occurring in the anthracite mines are traceable to carelessness on the part of the mine workers, it was agreed at a mine safety meeting conducted by mine inspectors and various coal company officials in the offices of the Glen Alden Coal Co., Scranton, last week. Upon motion, a resolution was adopted asking that the mine workers be represented at another conference to be held soon. Last week's conference was the second within a short time and

manifests the desire of the anthracite operators to do all in their power to prevent mine fatalities. In attendance at the meeting were State Mine Inspectors P. J. Moore, Augustus McDade, Jenkin T. Reese and L. M. Evans, and representatives of the Temple, Glen Alden, Scranton, Pennsylvania and Hillside, Von Storch, Price-Pancoast, Moffat, and Mid-City coal companies.

The State Bureau of Workmen's Compensation during the month of May received reports of 157 fatalities in Pennsylvania's industries. Of this total 62 occurred in the bituminous and anthracite mines. During the first five months of 1924 there have been 934 fatal accidents in the state's industrial establishments, and since Jan. 1, 1916, the date of the inception of the compensation law, there have been 21,402 fatal accident reports filed with the bureau. There were 108 permanent disability cases reported in May 1924, making the total for the year, up to June 1, 661. Since Jan. 1, 1916, 5,160 cases of permanent disability has been reported. In May there were also 13,832 cases of temporary disability reported, the total for the year being 73,291 and the total for the period of the act, 1,531,074. In May the Compensation Board awarded \$572,042 in fatal cases, the largest monthly total with the exception of March, when \$618,985 was awarded. The 1924 total award for fatal cases so far has been \$2,677,306 and since the beginning of 1916 the total has been \$45,822,525. The fatal compensation paid last month was \$358,607, making the total for the first five months of 1924, \$1,518,224. Since the beginning of 1916, \$16,437,964 has been paid in compensation to dependents of persons killed in Pennsylvania's industries. The disability compensation paid in May was \$691,212, making the total for 1924 up to June 1, \$3,003,347. Since the compensation system was started \$37,938,098 has been paid in disability compensation. The total compensation paid for all causes has been \$54,376,062 since Jan. 1, 1916, and of this sum \$4,521,571 was paid by the board since Jan. 1, 1924.

Approximately 900 men and women employed by the Glen Alden Coal Co. were guests of the company at a ban-



Courtesy U. S. Distributing Corp.

No. 9 Colliery, Pennsylvania Coal Co., Pittston, Pa.

At this plant is both a shaft and a slope and no less than seven seams in operation. The mines are in Luzerne County.

quet, concert, entertainment and dance in Irem Temple, Wilkes-Barre, a week ago. The affair was tendered the employees in recognition of the excellent work performed during the past year. W. W. Inglis, president of the company, presided. At the banquet a silent toast was given in honor of the fourteen men who lost their lives in the gas explosion at the Loomis colliery.

WASHINGTON, D. C.

F. G. Tryon, geologist in charge of coal statistics for the U. S. Geological Survey, is en route to London to attend the World Power Conference.

WEST VIRGINIA

The Talbott Fuel Co. has begun operations at its new mine at Arnettsville in the Monongalia County field, where it has sunk a 160-ft. shaft to the Sewickley vein. The company has about 475 acres available for development.

Operations have been resumed at the No. 5 mine of the Crow Orchard Improvement Co., at Eccles, after an idleness lasting since Dec. 15. Although the Eccles plant has been shut down for so long, the property was in readiness for operation whenever it was possible to resume.

The Central Pocahontas Coal Co., operating in the vicinity of Welch, in McDowell County, has resumed operations at its mine. The first group of miners reported for duty June 6 and by June 9 there was a full complement of men at work. It is understood that there are enough orders on hand to keep the mine running full time for a period of 30 days.

The entire crop of graduates of the department of mining engineering at West Virginia University has been absorbed by the Hudson Coal Co. One of the graduates was J. L. Orr, son of J. M. Orr, general manager of the Hudson company. Another is C. Y. Shih, of Fukien, in southern China. Both men received the degrees of Bachelor of Science in Mining Engineering this spring. Shih eventually expects to return to his native land and aid in developing rich tracts of coal land in Fukien and adjacent provinces. A post graduate student at the University was a Mr. Kwong and he too after a tour of the anthracite fields expects to go to work with the Hudson company.

At the Pinnacle operation of the American Coal Co. on Crane Creek, in southern West Virginia when a pile of slate near the tippie of the coal company exploded as the result of high water; the explosion buried a dwelling at the foot of the pile, seven people being killed. Two men of a rescue party who attempted to rescue those in the dwelling are believed to have been killed when a second explosion occurred. It was necessary to dynamite a railroad bridge in order to save the commissary and several dwellings of the Rolfe Colliery Co., also in the flooded area, where much damage was done. In many places there were such

serious washouts on the Norfolk & Western that it was not possible to use the main line either for freight or passenger transportation for several days.

CANADA

The Pacific Coast Coal Mines, which formerly operated the Morden mines, near South Wellington, B. C., is being reorganized and is expected to resume shipment this fall. The Morden mine is one of the best equipped on the coast. The company, which has been in liquidation also owns a coal concession at Hequach, near Alert Bay, where some development work has been done.

The possibility of Nova Scotia Coal providing a solution of Ontario's fuel problem was given a general canvass at a conference in Toronto last week between Premier Ferguson and representatives of Nova Scotia coal interests. The meeting was arranged by Premier Armstrong of Nova Scotia and strong representations were made by the eastern representatives of the ability of Nova Scotia Mines to aid fuel conditions in Ontario.

The Dominion Government has established a minimum price at which coke may be bought by buyers in the Province of Ontario. The established rate is \$7 at Black Rock and \$7.50 at Detroit for any kind or size of coke. The regulation was passed, it is stated, at the instance of the Hamilton By-Product Co., which alleges that it cannot manufacture the product and sell at a lower price. Seventy-five per cent of the coke coming into Ontario is used for domestic purposes, which means that the government is penalizing the domestic consumers for the benefit of a plant which does not produce 2 per cent of the coke consumed in Ontario.

Output of coal from Canadian mines during March was 1,537,000 net tons, an increase of 25 per cent over the tonnage for the previous month and 15 per cent above the average for the month for the five preceding years. The output showed an increase of 352,000 tons in Nova Scotia, but decreases of 14,000 tons in Alberta, 13,000 tons in British Columbia, 7,000 tons in Saskatchewan and 3,000 tons in New Brunswick. The cumulative output from all mines for the first three months of 1924 was 4,282,000 tons, an increase of 3 per cent over the preceding five-year average for the same period. Comparison of March and February figures covering the total importation of coal from the United States and Great Britain showed an increase of 22 per cent. March imports amounted to 1,576,000 tons, while in February 1,281,000 tons was brought in. The March importations this year were 14 per cent greater than the five-year average for the month. During the month, 1,200 tons was imported from Great Britain. Total importations of all coal for the three months of 1924 was 4,090,000 tons, an increase of 8 per cent over the preceding five-year average for the same period. Imports of anthracite for March totaled 390,300 tons. This was 36 per cent more than in January and 4 per cent higher than the five-year average for the month.

Anthracite imported from the United States amounted to 389,100 tons, while 1,200 tons came from Great Britain during the month. The total amount of anthracite imported during the three months of 1924 was 1,021,600 tons, a decrease of 3 per cent from the five-year average for this period. Exports of Canadian coal for March were 32 per cent more than in February. The quantities were: March, 94,600 tons; February, 71,800 tons. Comparison of the March exports with the preceding five-year average showed a decrease of 54 per cent. Cumulative exports for the three months amounted to 249,100 tons, or 58 per cent less than the five-year average for the same period.

New Companies

The Oshaba Domestic Coal Co. has been incorporated in Birmingham, Ala., by E. J. Blackwood, E. R. Blackwood and others.

The Superior Briquet & Fuel Co., of Tacoma, has been incorporated with a capital stock of \$99,000 by A. F. Plant, A. E. Burkhalter and F. C. Hewson.

The New Beaver Coal Co. has been incorporated in Cleaton, Ky., with a capital stock of \$100,000, by John W. Price, John W. Basin and R. S. Lytle.

The Rainbow Coal Mining Co. has been incorporated in Montgomery, Ala., with a capital of \$10,000, by Homer F. Baird, Q. M. Selcer and others.

The American Coal & Power Co. has been incorporated in Denver, Colo., with 10,000 shares of no par value, by H. W. Newcomb, C. M. Tausig and F. W. Herres.

The McArthur Coal Co. Ltd., of Toronto has been incorporated with an authorized capital of \$40,000. The provisional directors are Wilfred C. James, Warwick H. Noble and Charles T. S. Evans.

Coal Service of Canada, Ltd., with an authorized capital of \$300,000, has been organized at Montreal and a Dominion charter granted. The company will engage in business as wholesale and retail dealers and operators. Montreal lawyers are mentioned as the incorporators.

Publications Received

U. S. Government Specification for Lubricants and Liquid Fuels and Methods for Testing. Bureau of Mines, Washington, D. C. Technical paper 323A. U. S. Government standard specification No. 2c. Pp. 89; 6x9 in.; illustrated.

Conduit Wiring. by Terrell Croft. Pp. 458; 5 1/2 x 8 1/2 in.; illustrated. Price \$3. A complete and practical explanation of modern practice in the installation of conduit wiring. McGraw-Hill Book Co., 370 Seventh Ave., New York City.

Handbook on Engineering (Steam and Electrical), by Henry C. Tulley. Seventh edition, fully revised and enlarged by James F. Hobart. Three volumes. Pp. 1,155; 5 1/2 x 8 in.; illustrated. Price \$7.50. McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York City.

Principles of Electric Motors and Control. by Gordon Fox. Pp. 492; 5 1/2 x 8 in.; illustrated. Price 3.50. Explains the principles, construction and performance of all types of motors and controllers in commercial use, for both direct-current and alternating-current equipment. McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York City.

Alternating-Current Armature Winding. by Terrell Croft. Pp. 352; 5 1/2 x 8 in.; illustrated. Price \$3. Explains how to assemble and connect the new winding into the stator, how to determine whether or not it is feasible to reconnect a given winding for operation at a voltage, frequency, phase or speed other than that for which the machine is rated and how to make the reconnection. McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York City.

Traffic News

Denies Lower Coal Rate On Gauley Branch of C. & O.

The Interstate Commerce Commission has denied an application by the Chesapeake & Ohio Ry. for authority to continue to maintain rates on bituminous coal from mines on the northern portion of the Gauley branch of the C. & O. to destinations in numerous states lower than from intermediate points on that branch.

Hearing on Coal Rates to Iowa Transferred to St. Louis

After two weeks of taking testimony in Des Moines, Iowa, Examiner Disque, of the Interstate Commerce Commission, late last week transferred to St. Louis, Mo., the protracted hearing on coal rates from Illinois, Indiana, Kentucky, Tennessee, Ohio, West Virginia and part of Virginia into Iowa. The hearing is to be resumed again in Des Moines some time in July. The State of Iowa and various associations representing coal consumers charge in their complaints that freight rates on coal into Iowa are excessive as compared to rates into other states of comparable distance from producing fields.

Dakota Lignite Rates Hang Fire

The Interstate Commerce Commission has handed down another of its split decisions in the North Dakota lignite case. The proposed increase in rates suggested by the railroads, of 40 to 50 per cent, was held to be unwarranted and the suggested rates cancelled. At the same time it was held that the old rates were too low, but there was lacking sufficient evidence to indicate what they should be. A suggested schedule of the examiner who conducted the hearing is named for consideration. This merely puts the whole question off for another complete hearing. It apparently accepts the suggestion that as lignite is of a lesser fuel value it is entitled to, a lower schedule, but does not determine what that rate should be.

Mines on Greenbrier & Eastern Want New River Rates

The Interstate Commerce Commission is being urged vigorously by coal operators on the Greenbrier & Eastern R.R. to affirm its original findings which makes New River district rates applicable from their mines. The commission handed down a decision in this matter on Dec. 9 of last year. In this decision the Chesapeake & Ohio and other carriers were required to establish eastbound and westbound rates from the Greenbrier mines which are identical with those applying to mines in the New River district. In January, however, the Chesapeake & Ohio filed an application for a rehearing, which was granted by the commission. The appli-

cation for rehearing was made on the basis that inaccurate information had been furnished by the complainants. This has been denied by them. They contend that the coal mines on the Greenbrier & Eastern produce coal similar in character to the smokeless coal of the New River, Winding Gulf, Pocahontas and Tug River districts located on the C. & O., the Virginian, the N. & W., the Sewall Valley and the Kanawha, Glen Jean & Eastern.

It is contended, for instance, that the Virginians policy is to restrict the movement of coal to Eastern destinations, having built an impregnable rate wall at one end of its railroad and succeeded in forcing the flow of traffic to satisfy best its own revenue needs.

Obituary

F. Murray Olyphant, for forty years secretary of the Delaware & Hudson Co., died on June 17 at his home in Englewood, N. J. He was 68 years old. Among the many charities to which Mr. Olyphant had long given active support, the one that most deeply enlisted his sympathies, was the Jerry McAuley Mission.

Charles M. Lilly, of Beckley, W. Va., a prominent coal operator, was killed by a flash from an electric wire at Packs Branch last week. Born near Hinton, Mr. Lilly was 49 years of age at the time of his death. When a young man he went to work in the mines in Raleigh County and by constant work and perseverance won his way to the top. At the time of his death he was president of two large operating companies, the Four Vein company, at Lanark, and the Packs Branch company, at Packs Branch. He also had other large interests.

Recent Patents

Mine-Rail Fastener and Anti-Spreader. Charles E. Fowler, Allais, Ky.; 1,479,131. Jan. 1, 1924. Filed Dec. 13, 1922; serial No. 606,569.

Mine Car. Hugh W. Sanford, Knoxville, Tenn.; 1,479,322. Jan. 1, 1924. Filed June 3, 1922; serial No. 565,567.

Art of Treating Coal. Walter E. Trent, Washington, D. C., assignor to Trent Process Co., Wilmington, Del.; 1,479,757. Jan. 1, 1924. Filed Nov. 12, 1919; serial No. 337,531.

Manufacture of Coal or Other Briquets. H. G. Lloyd, Surbiton, England, assignor of one-half to George St. Barbe, London, England; 1,479,822. Jan. 8, 1924. Filed Sept. 28, 1922; serial No. 591,116.

Coming Meetings

World Power Conference, Wembley, London, England June 30-July 12. O. C. Merrill, Federal Power Commission, Washington, D. C.

First International Management Congress, Prague, Czechoslovakia, July 21-24.

Rocky Mountain Coal Mining Institute. Summer meeting, Aug. 7-9, Rock Springs, Wyo. Secretary, Benedict Shubart, 521 Boston Bldg., Denver, Colo.

New York State Coal Merchants Association, Inc., 14th annual convention, Sept. 4-6, Stamford-in-the-Catskills, N. Y.; headquarters Churchhill Hall. Executive secretary, G. W. F. Woodside, Arkay Building, Albany, N. Y.

New Equipment

Splash-Lubricated Gathering Pump for Mine Use

The Columbus Gear & Pump Co. has recently placed upon the market the new gathering pump for mines shown in the accompanying illustrations. This machine is only 36 in. high, and consequently is well suited to installation in low coal beds. Its other dimensions are, width 30 in. and length 55 in.

This pump is built in three sizes,

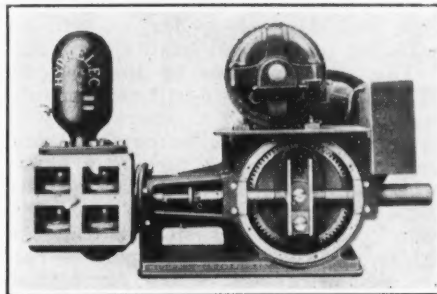


Fig. 1—Side View of Pump

In this picture the valve-chest and yoke-case covers have been removed, showing the simplicity of the internal parts. The yoke case normally is kept half full of oil, thus affording effective lubrication to all parts within.

that is, with cylinders of 4-, 5- and 6-in. diameters, the length of stroke in all cases being 7 in. The capacities of the three sizes are respectively 50, 75 and 110 gal. per minute. The speed in all cases is 66 r.p.m.

Several somewhat unusual features are embodied in the construction of this pump. Thus, motion is transmitted from the crank to the piston rod by means of a crank block working within a yoke. The piston rod is thus given a true harmonic motion. This yoke reciprocates within an oil-tight case that is kept nearly half full of oil.

In the construction of this machine

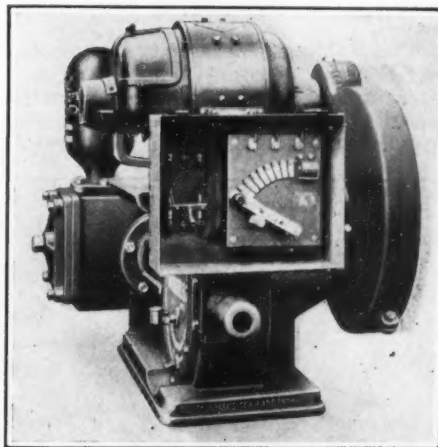


Fig. 2—End View of Pump

This shows how the motor and control apparatus are mounted directly on the pump frame. Possibility of relative movement between these parts, such as might result in misalignment of the gears, is thus rendered remote.

a tip has been taken from automobile design. Thus shafts, crank pin and like parts are turned, case-hardened and ground affording members that fit perfectly and endure long wear.

Both motor and starter are mounted directly on the machine frame and thus in reality form an integral part of the pump. This machine is regularly made with a bronze-fitted cast-iron cylinder but may also be supplied with cylinder and valve chest of acid-resisting bronze.

Truck-Mounted Electric Welding Outfit

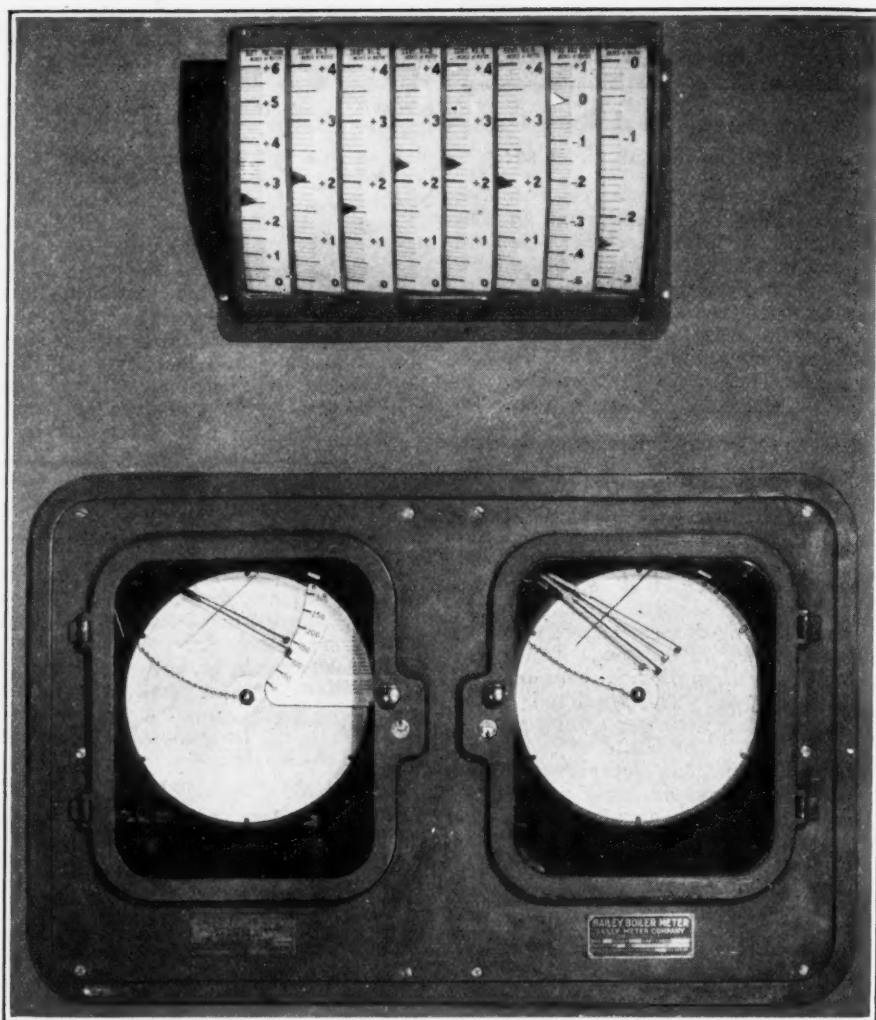
A new portable arc welder, said by the manufacturer to be designed to insure smooth and rapid deposition of metal with thorough penetration, delivers continuous power and permits rapid production, both with high current and large electrodes, as well as with low current and small electrodes.

This welder, made by the General Electric Co., is a two-unit set, consisting of a motor and a generator. The latter is self-excited, the current being regulated entirely by turning a hand-wheel on the generator. A self-adjusting, stabilizing reactor is provided, which automatically steadies the arc under all welding conditions. It can be used with any of the commercial sizes of metallic electrodes from $\frac{1}{8}$ in. to $\frac{1}{4}$ in. diameter. The voltage of the generator can be adjusted to suit the character of the work. High voltage for complete penetration on heavy work and low voltage to prevent burning through on light work are thus obtained at will. Many current values between 75 and 300 amp. can be obtained.

Among the operating advantages of this outfit are: an arc easy to start and maintain, roller-bearing wheels, holes in base for crane hooks and adaptability to long or short leads, for working close by or at a distance from the set.

Among the mechanical advantages are included motor and generator insulation designed to withstand severe operating conditions both with regard to duty cycle of the load imposed and general atmospheric conditions under which ordinary insulation fails. Bearings are waste-packed and oil cannot be spilled if the set is tipped when being moved.

This welding generator is a two-pole, self-excited, constant energy, single-operator machine with a dual magnetic circuit designed to operate at 60 volts open circuit and 20 to 25 volts under



Meters and Gages Give Direct Indication of Power Plant Operations

The multi-scale indicator at the top of the panel tells at a glance just how every device in the plant is functioning. On the charts at the bottom, records are made for comparative data.

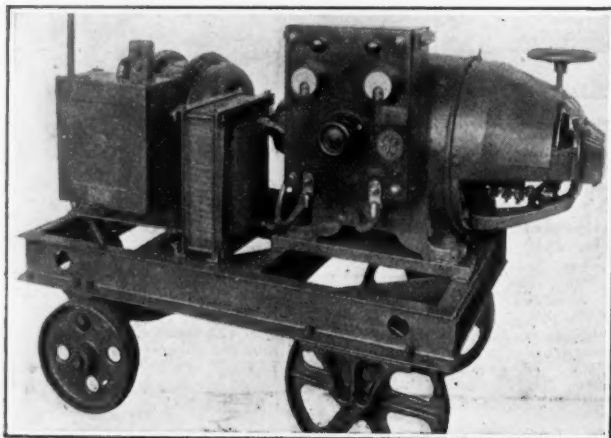
load. It is rated at 200 amp. for continuous service, 250 amp. for one hour and 300 amp. for short periods. The motor is a standard 10-hp. unit. The complete set has three bearings, the two units being close-coupled by a solid flange coupling. All parts, including generator, motor, generator control panel, motor starter and stabilizing reactor, are mounted on a welded structural steel base of rigid construction and light weight.

The assembled unit is about 63 in. long, 29 in. wide and 47 in. high and weighs about 1,600 lb.

Improved Steam-and-Air-Flow Recording Meters

It has long been known that boilers can be operated efficiently only when suitable recording meters are continually in operation to check up the various processes of converting latent heat energy in the coal to mechanical or, electrical energy. The designing engineers of modern power plants have appreciated the desirability of incorporating certain features in all indicating and recording instruments. The Bailey Meter Company, of Cleveland, Ohio, has recently placed on the market several new type flush-front meters and gages. These instruments are designed for panel-board mountings, and are so constructed that the meter casings are behind the panel.

A double flush-front meter, to be used with a boiler equipped with an economizer, is one of the most interesting of this new line. Steam flow and air flow are recorded on the left-hand chart while temperatures of the feed water entering and leaving the economizer are recorded on the right-hand chart. The multi-pointer gage above this meter is suitable for installation on a boiler fired with a forced draft chain grate stoker. It indicates wind-box pressure, fire compartment pressure, firebox draft, and chimney draft.



Arc Welding Outfit

Current regulation easily may be obtained by a slight turn of the hand-wheel. A stabilizing reactor automatically steadies the arc under all welding conditions. Either high or low voltage can be provided so that all welding may be done with current of the required pressure.

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Runs on Picking-Table Refuse

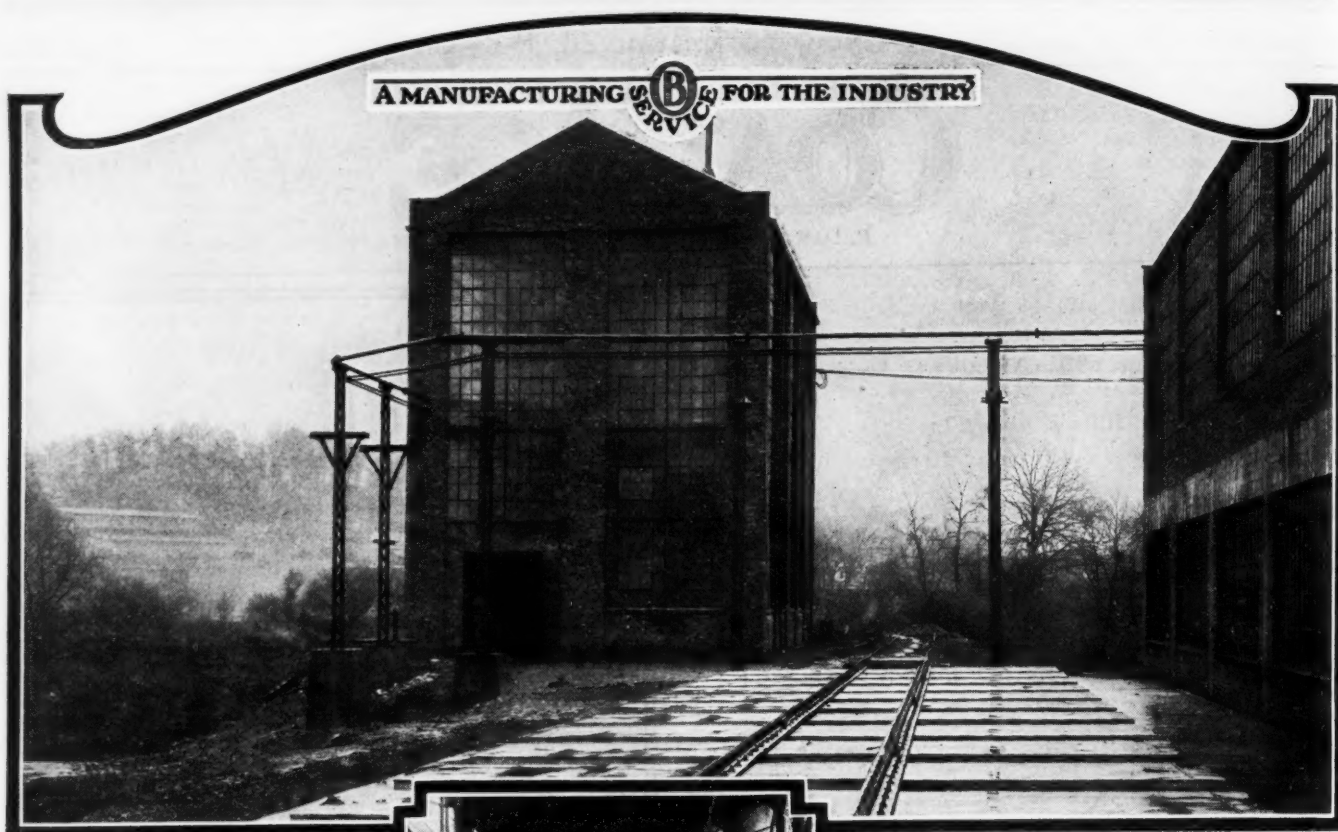
A power plant that is charged for refuse from the picking table at clean-coal rates uses that refuse and screenings for generating the steam by which its power is obtained. Yet it gets its power for 1.6c. per kilowatt-hour and is running only at about one-half load. This story which every one will want to read will appear next week in *Coal Age*. Perhaps you will desire after reading it to put your picking-table refuse in your boiler room, to get such a tidy figure for this waste material and to obtain your power at low figures like these. Maybe you might improve your coal if you could afford to pick it with a lavish hand as it is done at this plant.

Hope for Low Accident Rate

An article deals with speed in coal extraction and says it may prove as economical of life and limb as it is profitable from the viewpoint of lower costs and conservation of coal.

How Uncle Sam Manages His Leases

The Bureau of Mines makes regulations for Government leases. An article next week will give some interesting details regarding this regulation and supervision from the man who has charge of the latter.



POWDERED COAL

Rigid Technical Control of metallurgical operations and uniform production are vital to the manufacture of the products that have established the O-B name. That is why the most modern and efficient methods in utilizing fuel are employed in the O-B Plant. Powdered or pulverized coal plays an important part in supplying high quality and uniform grade O-B Products to you.

(Top) Exterior view of the O-B pulverizing plant at Mansfield. Note the pipes for transporting the powdered coal from pulverizing plant to points where utilized.

(Center) One end of the pulverizing plant showing dried coal storage, pulverizing mill, pulverized coal storage and distributing system.

(At left) Pulverized coal burning unit on the 20-ton melting furnace in the malleable iron foundry at Mansfield.

THE OHIO

Mansfield,

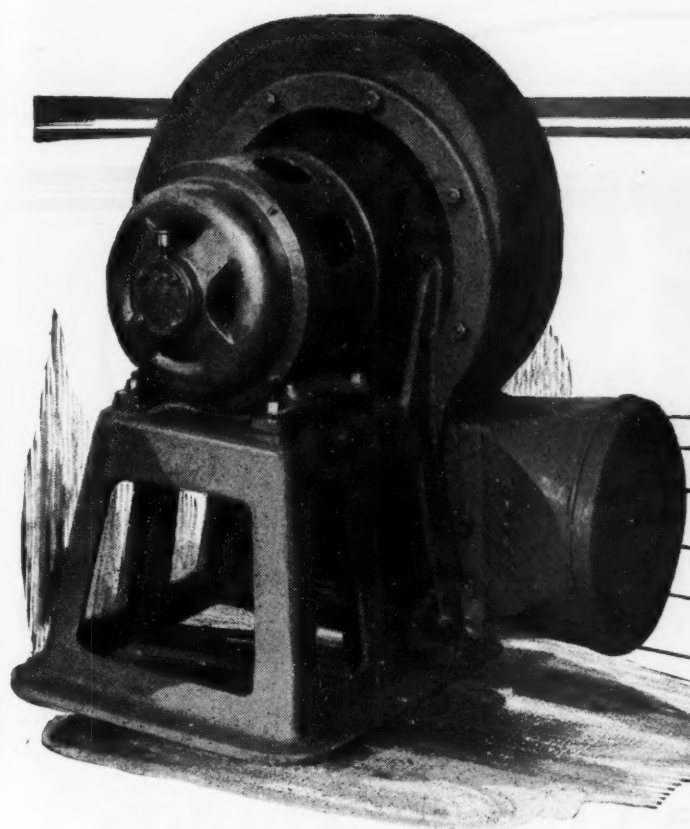
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BRASS CO.

Ohio, U.S.A.

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EQUIPMENT—RAIL BONDS—HIGH TENSION
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Before You Speed up Your Main Fan to Get More Air-

REMEMBER—To get twice the volume your fan is now doing, you must run it twice as fast, and this takes **EIGHT TIMES THE HORSEPOWER.**

A Jeffrey Universal Blower, installed to boost the current, will immediately improve your conditions at the working faces, while the work of improving the air courses is going on. Ventilation cost will be kept at a minimum, at the same time assuring efficiency from the miners.

Example:—Assume the main fan has a normal capacity of 80,000 C.F.M. at a certain speed, and the mine is divided into four splits, each requiring 20,000 C.F.M. The resistance in one split will only pass 10,000 C.F.M. Speeding

up main fan to get the additional 10,000 C.F.M. would be uneconomical because it would require double the fan speed, and the placing of regulators on the other three splits, requiring more than four times the horsepower.

The correct and economical thing to do is to place a Booster fan on the split requiring the additional volume and not touch the main fan.

Blowers and Boosters are built in sizes from 8 in. to 5 ft. 0 in. diameter. The smaller direct connected units are principally adapted for use with flexible canvas tubing for ventilating dead ends, entry driving, sinking shafts, driving tunnels, conveying rock dust, ventilation of underground hospitals, etc. All sizes carried in stock.

Ask for Booklets No. 399-B and No. 280-F

The Jeffrey Mfg. Company, 912-99 North Fourth Street, Columbus, Ohio

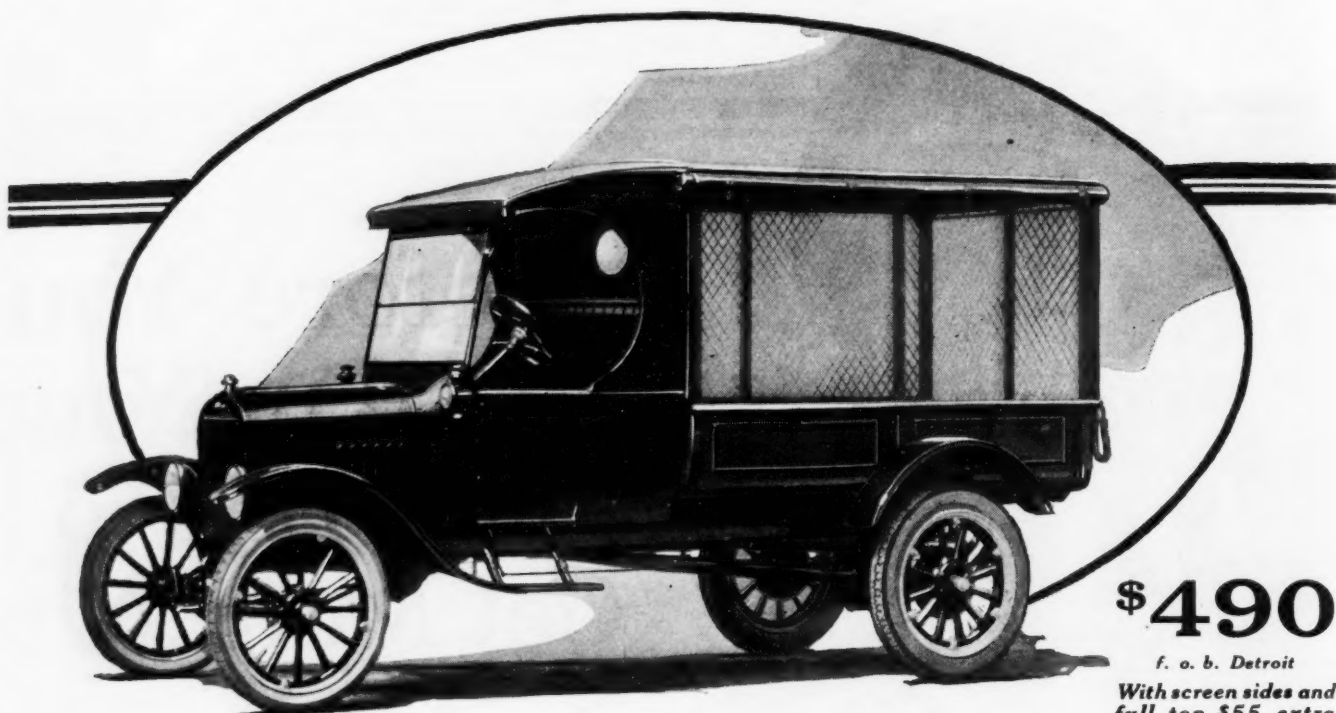
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COAL MINE EQUIPMENT



Why Ford is the Overwhelming Choice in the One-Ton Field

No more striking evidence of the high regard of truck operators for Ford performance and economy can be offered than the fact that 78% of all trucks in the one-ton class are Fords.

Only outstanding proof of exceptional value could have brought this dominant preference.

Only by demonstrating the utmost dependability and proving its ability to save under any and all conditions could this Ford One-Ton Truck have gained and held the good will

of so many operators year after year.

Lowest in cost, easiest to handle and simplest to maintain the Ford worm-drive Truck is the standard light-delivery unit of American business.

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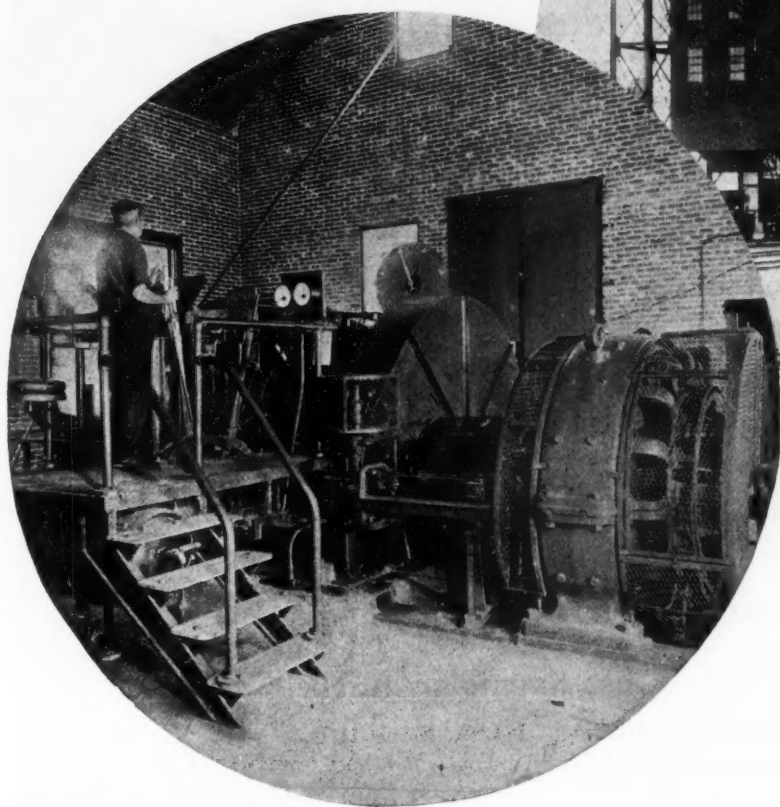
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CARS · TRUCKS · TRACTORS

500 tons per hour
from a depth
of 405 feet!



HERE'S an 850 horsepower Vulcan, hoisting "in balance" 500 tons per hour from a depth of 405 feet. The installation is at the Coverdale Colliery of the Pittsburgh Terminal R. R. and Coal Company.

The cage weighs 20,000 lbs.; cars, 5,600 lbs.; coal 10,000 lbs.; rope 2,000 lbs.

Other Vulcan Equipment

Electric Hoists
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The Vulcan used here is single reduction geared with a cylindro-conical drum 9 to 11 feet in diameter. An air released, weighted engine operates two post type drum brakes. An auxiliary motor shaft brake, a Vulcan Travel and Speed Limit Device as well as other special Vulcan safety devices, complete the equipment.

The maximum rope speed is 1,560 feet per minute.

There's a Vulcan Hoist
for every purpose

Vulcan Iron Works

Established 1849

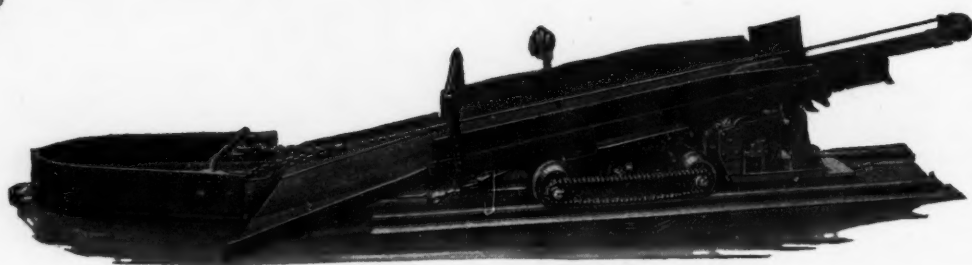
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VULCAN OF
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a New Loader

Built by Goodman



One Operator Has Nine of Them

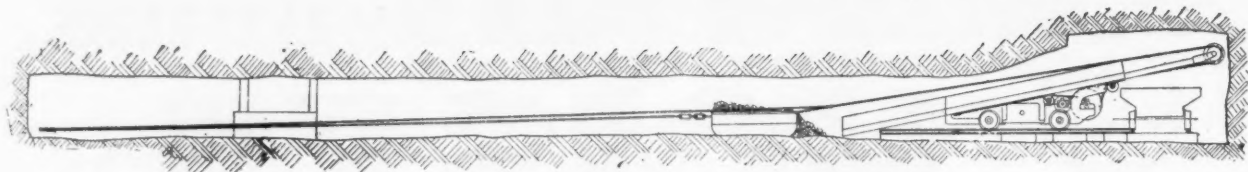
The "Type B" Loads on the Entry!

That's worth repeating: *The "Type B" loads on the entry!* No cars at the face. No tracks in the rooms.

This means: Saving in track. No yardage costs. Less haulage. An easier job keeping the loader supplied with cars.

More could be told here, but you would want to see our salesman anyway. So write us and he'll call.

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Sullivan Air-Electric Drilling Rigs

**Save Time
and Labor in
removing
Rock under
ground**

Rock Fault Pierced Quickly

At an Ohio mine, a Sullivan WK-26 Motor Driven Compressor, size 8x8, and a Sullivan Rotator Hammer Drill drove an entry through a rock fault in hard conglomerate.

The Compressor provided air at 80 pounds to the square inch. Holes were drilled to a depth of six feet in the center of the heading, and 2 spotters, one on each side, to a depth of four feet.

With this outfit 81 feet of holes were drilled in three hours' time.

This rig did as much work in two hours as was formerly done in eight hours with the old style breast auger. Just an instance of one of many kinds of useful work you can do with a Sullivan "WK-26" Compressor.

Ask for Bulletin 77 I-C.



SULLIVAN MACHINERY COMPANY
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Correct

National Pyramid Brushes—

for all operating conditions

BY MEETING correctly the conditions in numerous individual installations, National Pyramid Brushes have saved thousands of dollars for industrial plants, central and sub-stations, trolley and rail lines.

When you have a troublesome brush problem, we will gladly assist you in solving it.

Our sales engineers are always at your service.

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Changing Conditions Necessitate Redesign of Mine Cars



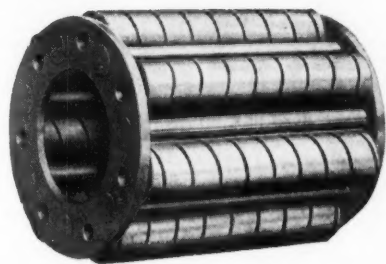
In the days of easy competition, coal costs could stand the extra tax due to wastefulness, but in these days of sagging markets only low cost coal mines employing economical methods can hope to survive.

Increased production usually results in lower costs, and one way to boost production is to install cars of greater capacity. Numbers of companies are taking this way out of their difficulty, even though it often requires an entirely new design of car, usually of the low, wide and long barge type for use in rotary dumps.

An operator recently told us that "these newer designs of mine cars with greater capacity make Hyatt bearings even more imperative. We used them under our old cars with complete success and couldn't get along without them now."

Many companies are throwing out entire lots of old cars, making the replacement with Hyatt bearing equipment especially designed by one of the many manufacturers who build Hyatt bearings into their mine cars.

If your production is dwarfed by small cars you can make it grow by having new cars designed which will carry more coal. And if equipped with Hyatt bearings they will have a lower power consumption than the old, small, plain bearing cars.



HYATT ROLLER BEARING COMPANY

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Keep Them Rolling

Trouble with your mine car wheels goes hand in hand with poor lubrication. Correct the cause and the trouble will vanish.

The cause is chiefly a type of lubricant that will not stay in the wheel bearings; the remedy is a semi-fluid grease of unchanging density. It should be of high lubricating value, impervious to water, and free from ingredients that clog and cake.

Such a lubricant is found in Keystone Grease No. 119 density medium, intended for equipment in good condition, and Keystone Grease No. 119 density heavy and Keystone Grease No. 119 density extra heavy for worn equipment.

Hyatt Roller-Bearing mine car wheels will operate for six months or more on one application of Keystone Grease No. 119 heavy. For solid roller-bearing mine car wheels Keystone Grease No. 2 density is recommended.

Write and ask us what our guarantee and our service department will do for you.

THE KEYSTONE LUBRICATING CO.

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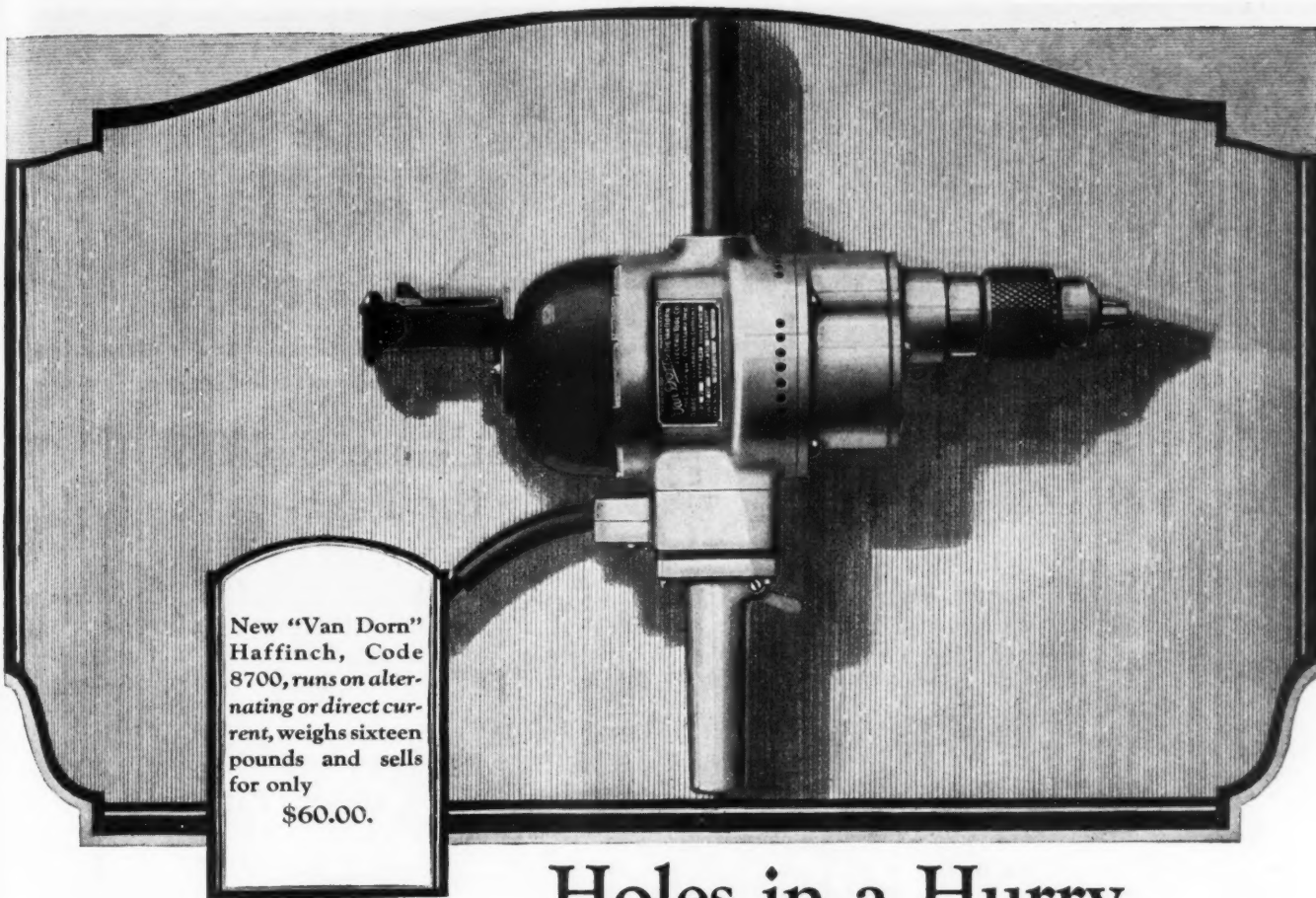
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chanical unit more ef-
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GREASE
The Master Lubricant
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Holes in a Hurry With This New "Van Dorn" Haffinch

An Electric Drill that has more "pep per pound" than any other drill on the market.

Mines everywhere will welcome this light weight, reasonable priced, half inch, "Van Dorn" Electric Drill that has more power and delivers more holes per man — per tool — per day than any universal electric drill ever offered to this field.

Haffinch is a wizard for speed on maintenance and repair jobs to mine cars, pumps, hoisting equipment, tipples, conveyors, crushers and other odd jobs without number.

You will find this light weight tool a time saver and a money maker for all "hurry up" jobs around the mines and a fine addition to the larger "Van Dorn's" that you have possibly used for 20 years.

A "Van Dorn" representative will welcome an opportunity to demonstrate it to you.



Your Copy of this valuable book is now ready. Everyone interested in more economical hole-making should send for this 60 page educational booklet. Sent free upon request.

The Van Dorn Electric Tool Co.

*Makers of Portable Electric Drilling, Reaming
and Grinding Machines, etc.*

Cleveland, Ohio

"Van Dorn"
**ELECTRIC
DRILLS**

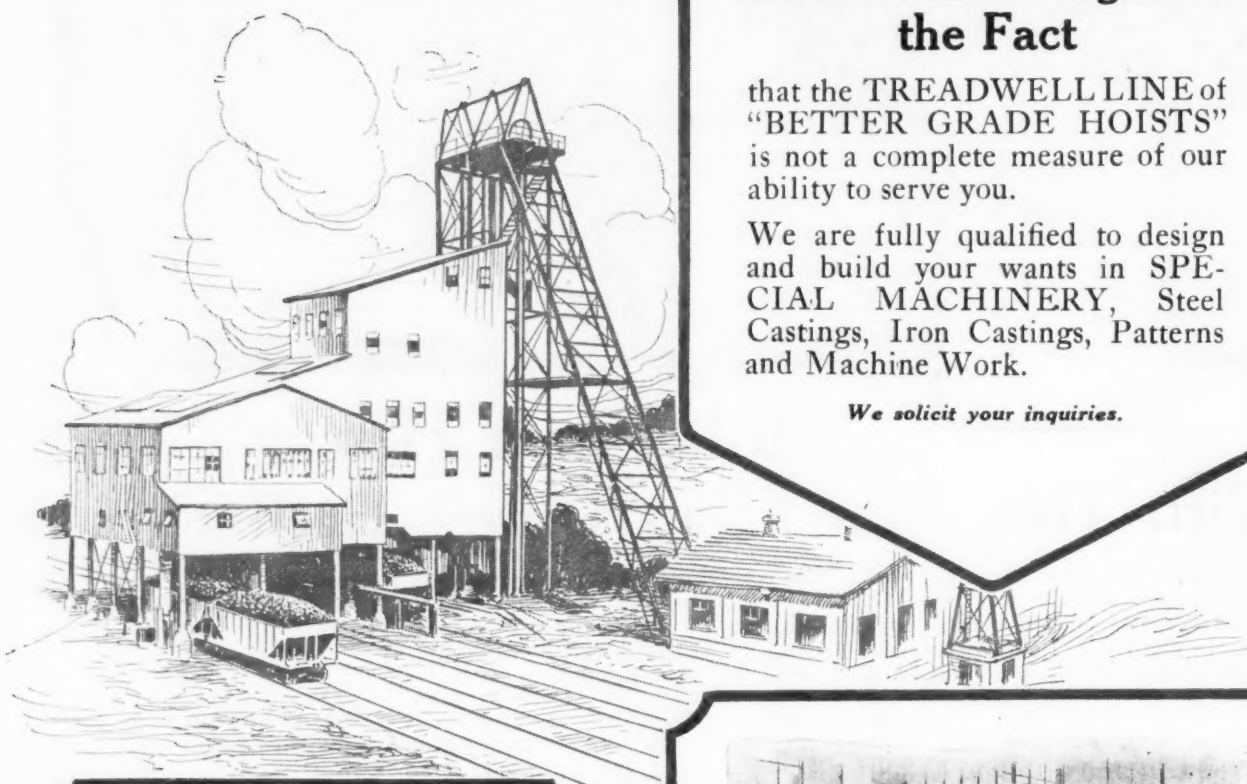
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Treadwell

Steam and Electric Hoists



Do Not Lose Sight of the Fact

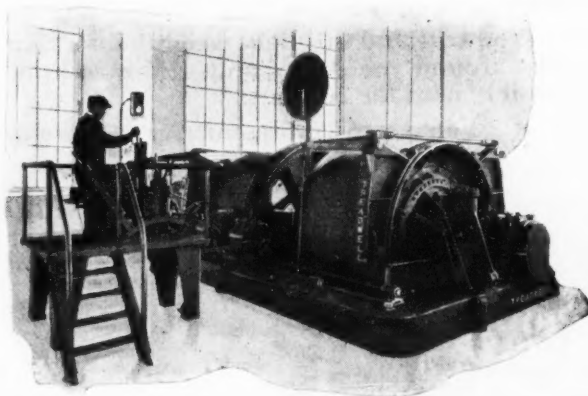
that the TREADWELL LINE of "BETTER GRADE HOISTS" is not a complete measure of our ability to serve you.

We are fully qualified to design and build your wants in SPECIAL MACHINERY, Steel Castings, Iron Castings, Patterns and Machine Work.

We solicit your inquiries.

Specialties

Steam and Electric Hoists
Tread-iron Chutes
Drives—Rope
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Breaker Machinery
Gears—moulded and cut teeth
Sheave Wheels



Treadwell Engineering Company

ROLLING MILL MACHINERY — PIPE MACHINES — ELECTRIC STEEL CASTINGS

Easton, Pennsylvania, U.S.A.

After the CEMENT-GUN (Trade Mark)

finishes a "guniting" job it is ready to apply ROCK DUST at any spot in the mine a hose will reach. In this important matter it is not wise to experiment with make-shift equipment—get a "Cement-Gun," the dual purpose

The "dual purpose" machine, and keep it outfit



busy "rock-dusting" and "guniting" all through the mine

!

Send this coupon and get details of the dual purpose outfit

THE "CEMENT-GUN"

IS NOT A RESTRICTED ARTICLE AND MAY BE PURCHASED AND USED BY ANY ONE.

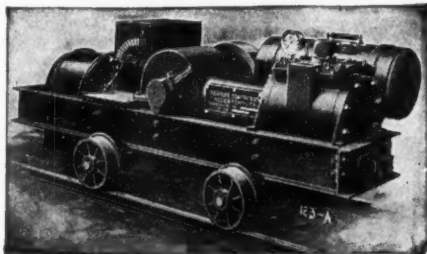
In order, however, to insure to all users of "Gunite" that they will obtain prompt and proper bids we have established a Contract Dept., and upon application we will be pleased to have them prepare estimates on your work.

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No "Cement-Gun" is Properly Complete Without a TRAYLOR Compressor

To Cement-Gun Co., Inc.
Allentown, Pa.

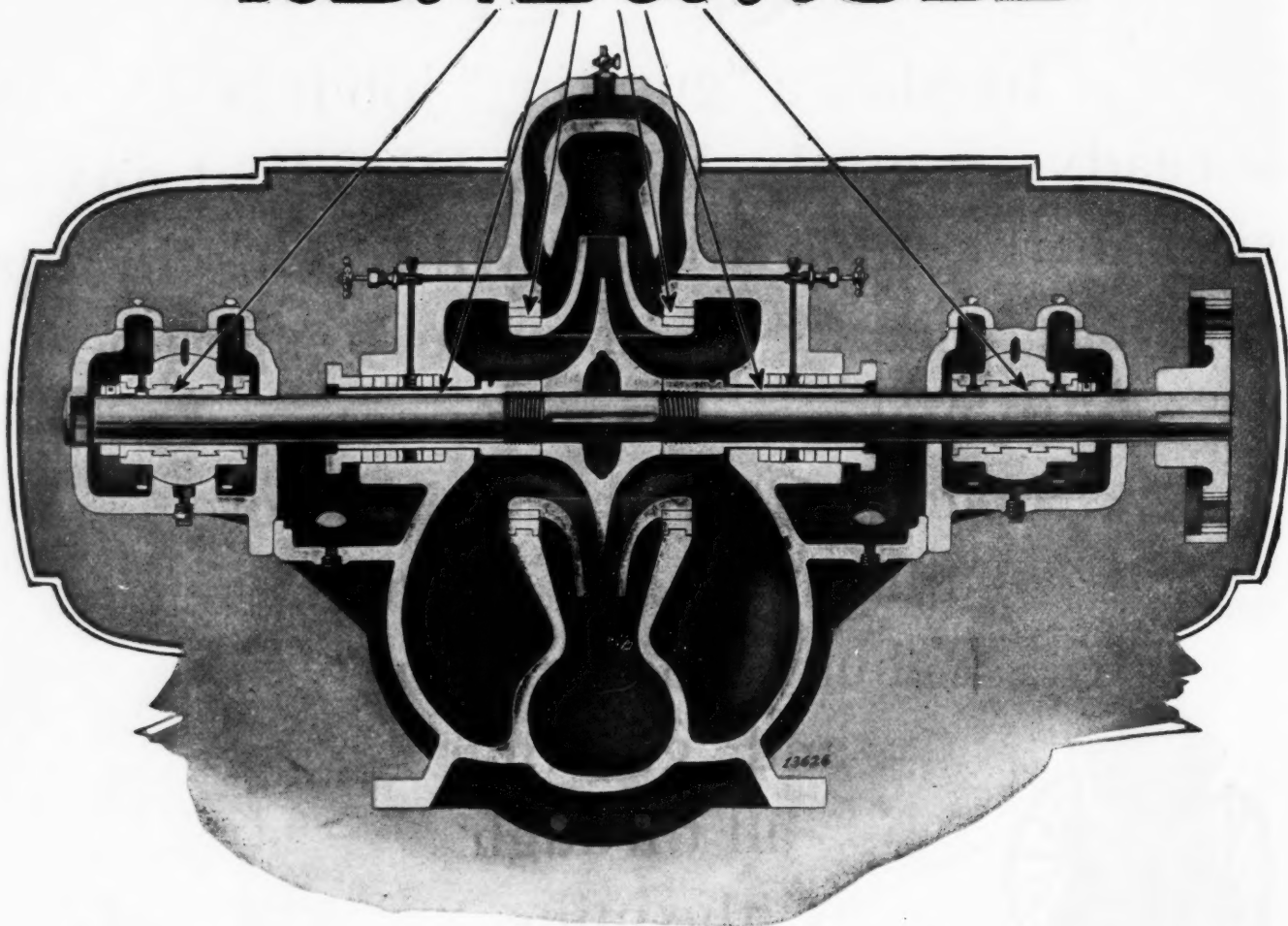
We are interested in knowing all about the "Cement-Gun" and its many advantages as a dual-purpose outfit for rock-dusting and guniting.

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THE immediate renewal of wearing parts, namely wearing rings, shaft sleeves and bearings is provided for in the design of Cameron Pumps, and insured by a stock always on hand—Shut downs and repair costs are cut to a minimum.

A thorough shop test made of each pump before shipment proves it

mechanically perfect and hydraulically correct. Certified copies of test results will be furnished on request.

The sound judgment of Cameron Engineers is built into every pump. In relying on their experience you get a unit of proven design—a pump built to meet your specific requirements.

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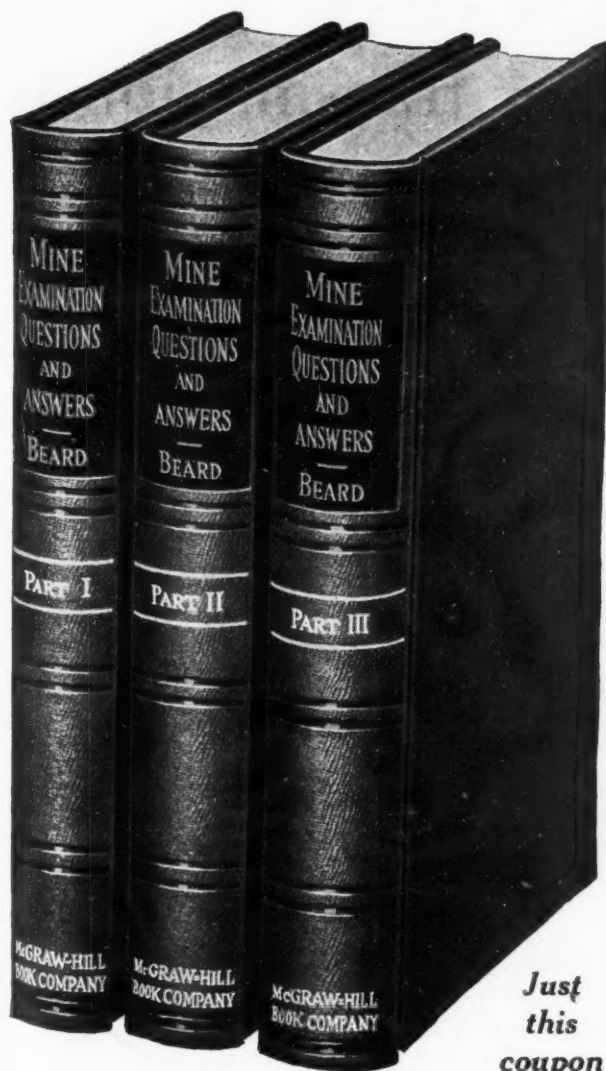
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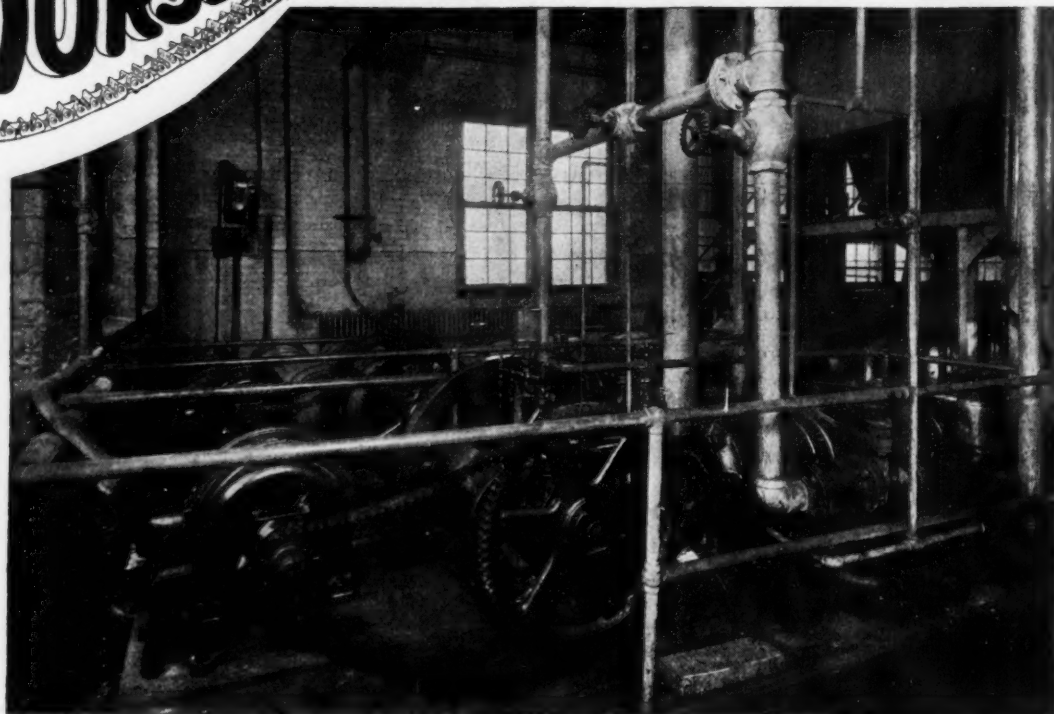
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Morse Chains deliver the maximum power from the motors to pumps, and other driven machinery, smoothly, noiselessly, and with the greatest economy.

Power users in every branch of industry have learned they can rely on Morse Chains to perform their allotted task.

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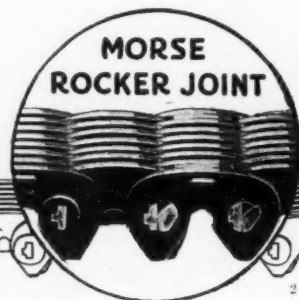
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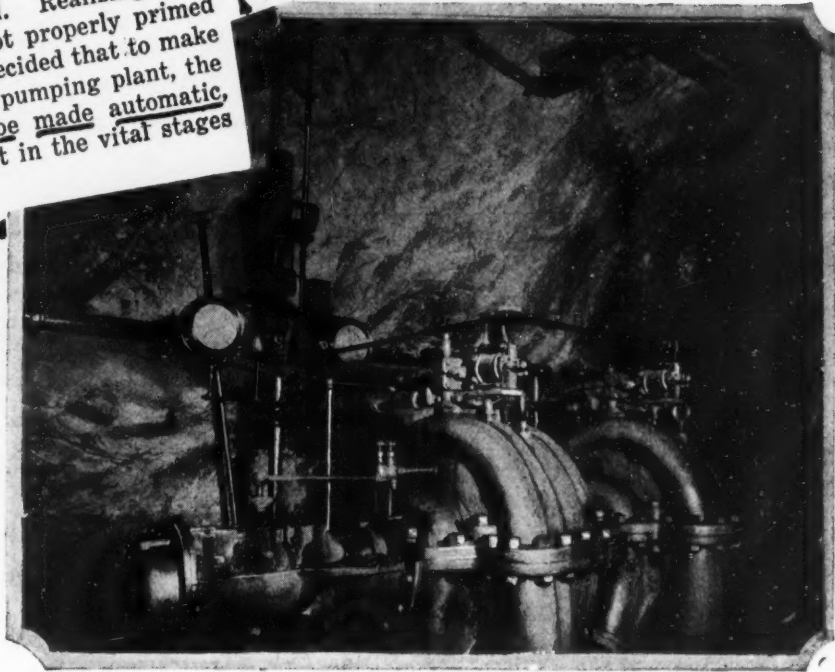
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2121-30

The Reading engineers became anxious over these stoppages and after a thorough investigation decided that many of the breakdowns were due in part at least to the operator's starting the pumps before they were properly primed and continuing the operation of the pumps after the sump was lowered. Realizing that any attempt to operate the pump not properly primed was disastrous to the pump, it was decided that to make a really successful centrifugal mine pumping plant, the several manual operations should be made automatic, thus eliminating the human element in the vital stages of operation.

Extract from
Coal Age—9/13/13



“eliminating the human element in the vital stages of operation”

This is exactly what the Hazleton Automatic Pumping and Control Unit does. And it was built in answer to a vital need.

This Hazleton Pump is primed, started, protected and controlled automatically.

When the water rises to a predetermined height, a float, in connection with a vacuum breaker, rises, effecting the closing of an electric control circuit. When this circuit is closed, the priming pump starts, opening the priming valves. When the priming is completed, the centrifugal pump starts. After the water is pumped down to a predetermined level, the electrical control stops the pump.

Protective devices, too, take care of any possible emergency. By means of these devices, the operation cannot go on if there is any danger of leakage in the pipe lines or any danger of the pump losing its water.

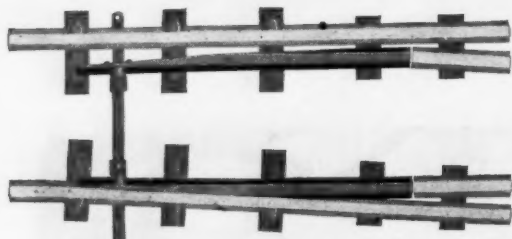
Thus with the Hazleton Automatic on the job, disasters due to human mistakes or forgetfulness are eliminated once and for all.

Complete particulars on the operation of this new revolutionary pumping unit will be sent you by return mail, along with Bulletins on our entire line of Centrifugal Mine Pumps, Priming Pumps and Valves, Vacuum Breakers, Check Valves, etc. Let us know where we can reach you.

BARRETT, HAENTJENS & CO., HAZLETON, PA.



Bethlehem Mine Specialties



Heavy Duty Switch, Design 396

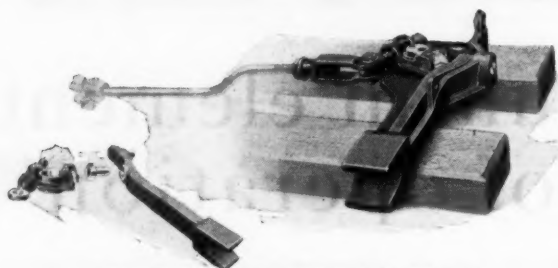
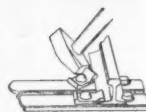
BETHLEHEM HEAVY DUTY SWITCH is fitted with extra heavy plates and braces—practically corrosion proof—will stand unlimited abuse—derailments eliminated—lengthens tie life—maintenance expense wiped out—plates and braces last indefinitely—switch points cost no more to renew than other kinds.



No. 2 Bethlehem Steel Mine Tie

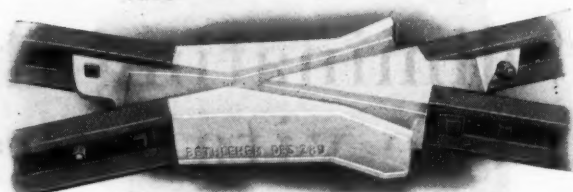
BETHLEHEM MINE TIES are in one piece—no loose parts to mislay—clamping clip quickly turned to position with hammer—track always to gage—extra ties can be added or taken out without disassembling track

—maximum head room—longer life than wooden ties—greater strength by increased weight over earlier Cambria designs—can be used many times—popular with miners.



Paralled Throw Switch Stand, Model 1217

BETHLEHEM PARALLEL THROW SWITCH STAND, MODEL 1217, is adjustable for any throw—lever throws parallel to the track—when in normal position, lever is on “dead center” and switch is positively held—only 3 in. high—only 3 moving parts—no bolts—can also be furnished with spring rod.



Solid Cast Frog, Design 289

BETHLEHEM SOLID CAST FROG, Design 289, is made either of carbon, or manganese steel—strictly one-piece construction with no rivets or plates to work loose—flange bearing feature makes for smoother riding and reduces wear on wing rails and point—unbreakable and easy to install.

Bethlehem also manufactures heavy track work for steam Railroads, such as Rails, Guard Rails, Switch Stands, Crossings, Tie Plates, Fish Plates, Splice Bars, Solid Cast Frogs, Special Track Work, etc.

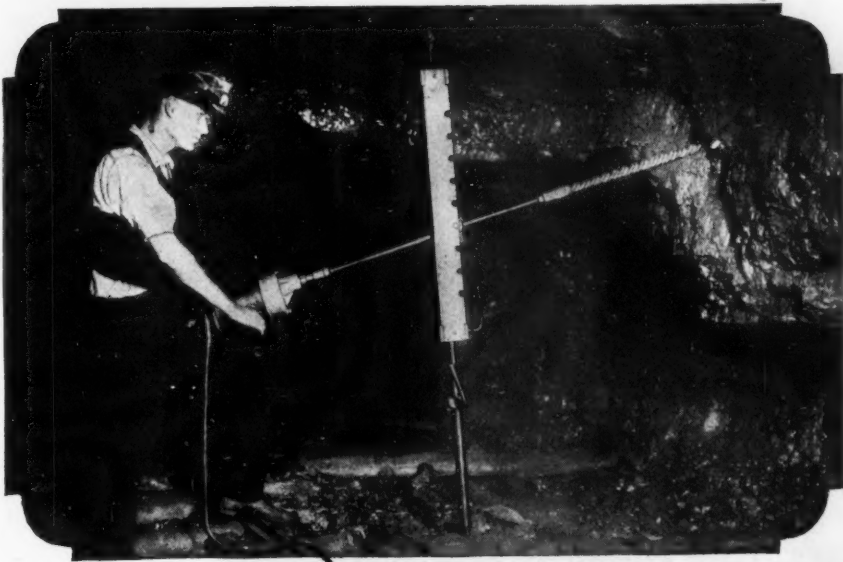
BETHLEHEM STEEL COMPANY, General Offices: BETHLEHEM, PA.

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Bethlehem Steel Export Corporation, 25 Broadway, New York, Sole Exporter of Our Commercial Products

BETHLEHEM

Track Equipment for Mine Service



TIREX Cord Cuts Drilling Costs

Economical, efficient drilling depends largely on the flexible cord upon which the tool must depend for power. Cord failures mean idle tools, idle men and expense of repairs. Even a high grade tool will make a poor showing when it is frequently laid up for cord repairs or replacement.

TIREX costs less than ordinary cords because it lasts so much longer. The conductors are flexible and are adequately insulated with a high grade rubber compound. The outer covering is a 60% rubber sheath having the wearing qualities of a first class tire tread. It is almost wearproof.

TIREX costs less than ordinary cords because it lasts so much longer.

SIMPLEX WIRE & CABLE CO

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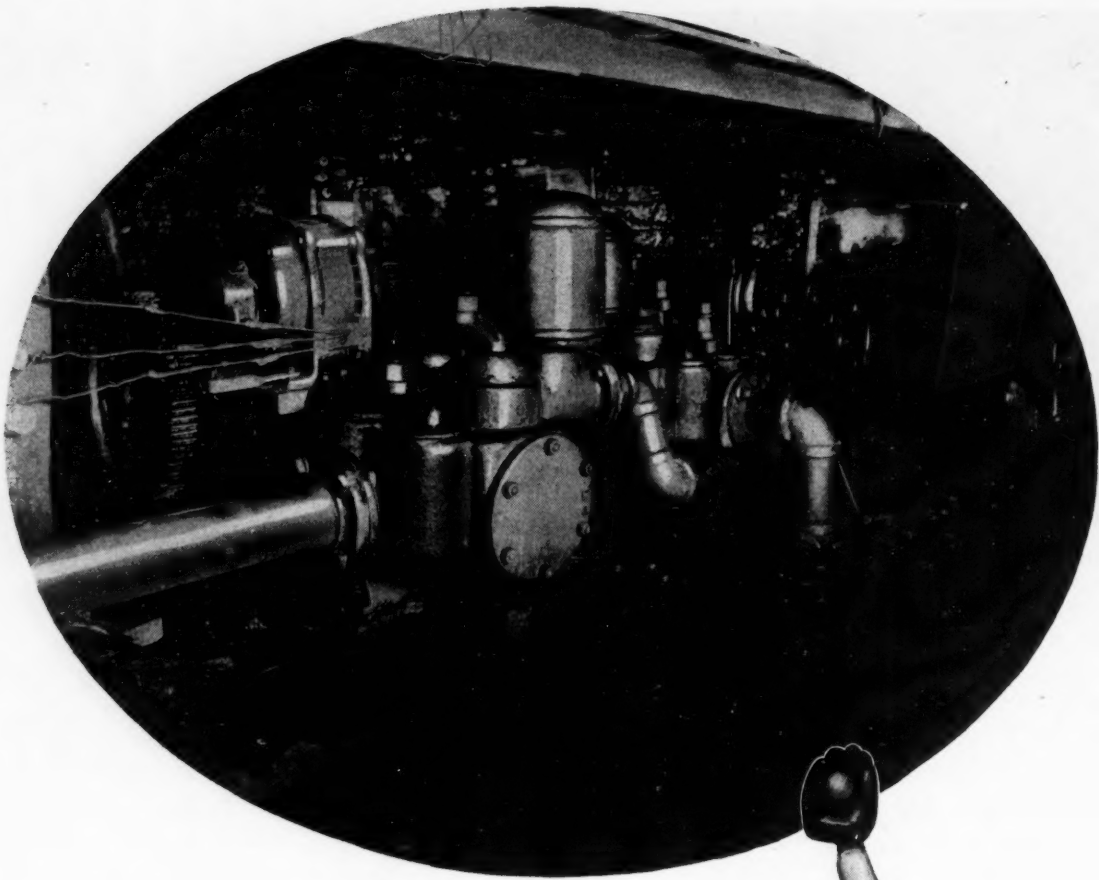
CHICAGO SAN FRANCISCO

TRADE

TIREX

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The Simplex Cable that wears like a Cord Tire



10 Innings—No Errors!

A ten-inning ball game with no errors is considered a remarkable performance in the world of sport.

The *ten year* record of dependable mine pumping service established by the Deming pump shown in the view above is not unusual. This Deming "Neptune" Double-Acting Piston Pump was installed ten years ago in the mines of the Valley Smokeless Coal Company, Johnstown, Pa. It has been in 12-hour-a-day service ever since, working under the worst acid conditions, and its owners report *it has never given any trouble!*

*For Complete Catalog of
Deming Mine Pumps, Write*

THE DEMING CO. Est. 1880 Salem, Ohio

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Deming

HAND AND POWER PUMPS FOR ALL USES

MINE PUMPS



Like giant hands, restraining~

Always on guard, never apparent, the restraining rings stand behind the normal governing devices in the Westinghouse Small Turbine for generator drive, prepared for instant action and providing an insurmountable factor of safety against overspeeding due to motorizing of generator or other accidental causes. This splendidly characterizes the high state of perfection to which the small Westinghouse unit has been developed.

Westinghouse
Electric & Manufacturing Company
East Pittsburgh, Pennsylvania
Sales Offices in All Principal Cities of the
United States and Foreign Countries

Westinghouse

Ready for full capacity?



Oxweld Portable Outfit

The Ambulance of Industry

THE oxy-acetylene welder's portable truck outfit made by Oxweld has frequently been called the ambulance of industry. By means of this little truck a complete oxy-acetylene welding and cutting outfit with cylinders can be transported easily and rapidly to any part of your plant. Repairs can be made quickly and economically and long and expensive shut-downs avoided. Frequently parts may be repaired without dismantling the machine, and nearly always repairs can be made on the spot, thus avoiding the necessity of carrying broken parts through your plant.

If you wish to save money on plant maintenance, send for the nearest Oxweld Resident Engineer.

IS YOUR PLANT ready for full capacity production?

Have your engineers and master mechanic seen to it that every piece of machinery is in operating condition? You realize that periods of part-time or shut-down are ideal for making repairs.

Oxy-acetylene welding will repair many machines at a fraction of the cost of replacements. Oxy-acetylene welding will enable you to reclaim many broken or rejected parts. Oxy-acetylene cutting will help you make changes rapidly and economically.

If you use Oxweld welding and cutting apparatus, Oxweld engineers and fieldmen will gladly show you how the oxy-acetylene process can help keep your plant equipment in working condition at all times. Send for free book, "Oxweld Can Do It." It illustrates many applications.

OXWELD ACETYLENE COMPANY

Chicago
3642 Jasper Place

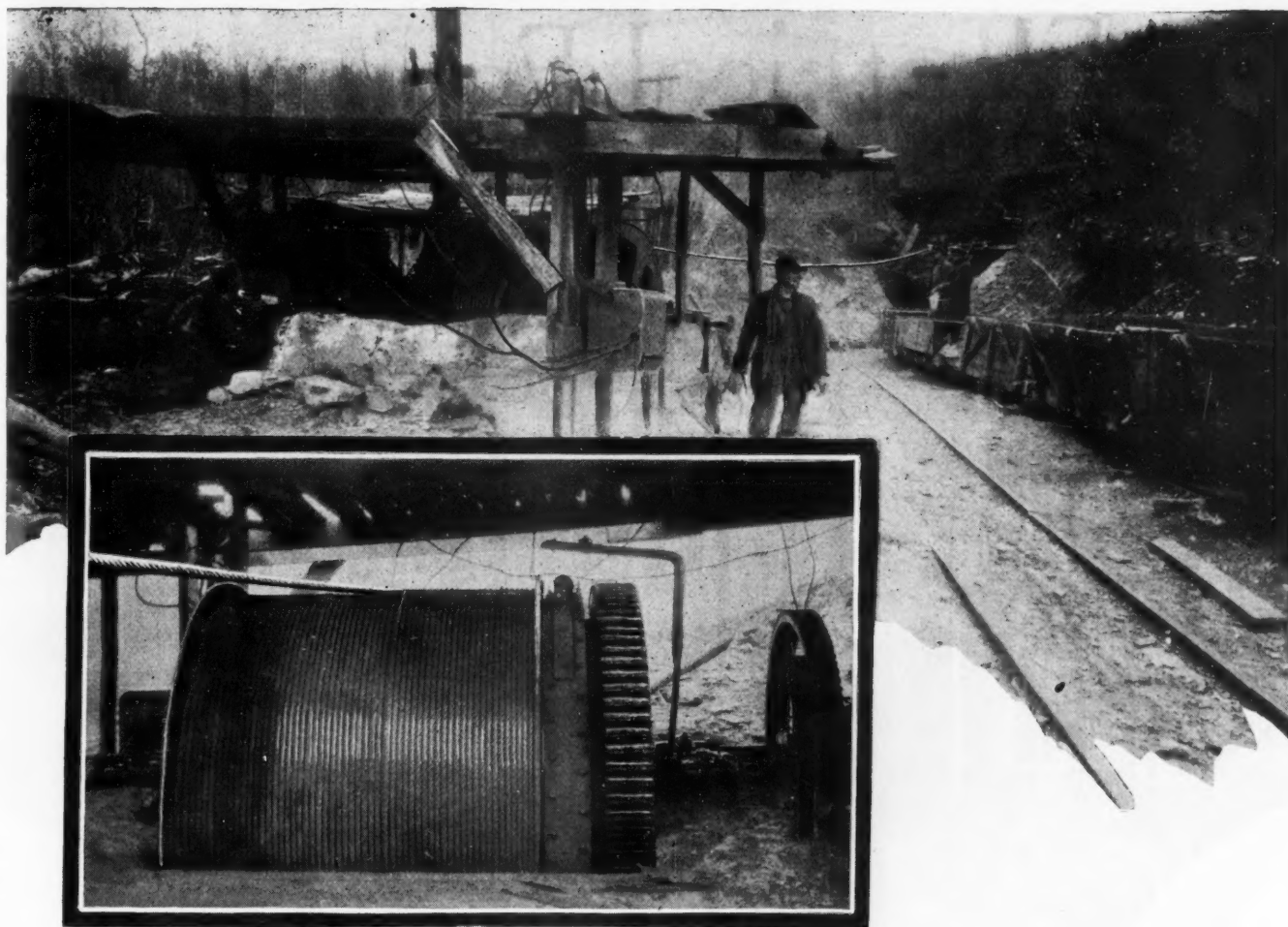
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Oxweld

WELDING AND CUTTING APPARATUS

WORLD'S LARGEST MANUFACTURERS OF WELDING AND CUTTING EQUIPMENT



Hard pulls and rough going? No Matter!

Increasingly heavy loads and rapid acceleration on Rope haulages and hoists—

The grinding and tearing effect of hard slope conditions on Wire Rope as it pounds the rollers and drags on the ground—

The severe bending stresses set up as the Ropes run over the small drums and sheaves that are of necessity used on some operations —

Problems such as these are successfully solved by HAZARD Wire Rope engineers.

Constant research work—laboratory selection of raw material—finest wire drawing and rope making skill, combined with the scientific adaptation of the proper Wire Rope to each operation on an engineering basis:—

That is why HAZARD Wire Rope will so far outwear the average rope, and why it is most economical.

Let us look into your most difficult Wire Rope operations and show you how to cut down your ton costs.

Hazard Manufacturing Company
Wilkes-Barre, Pa.

New York

Pittsburgh

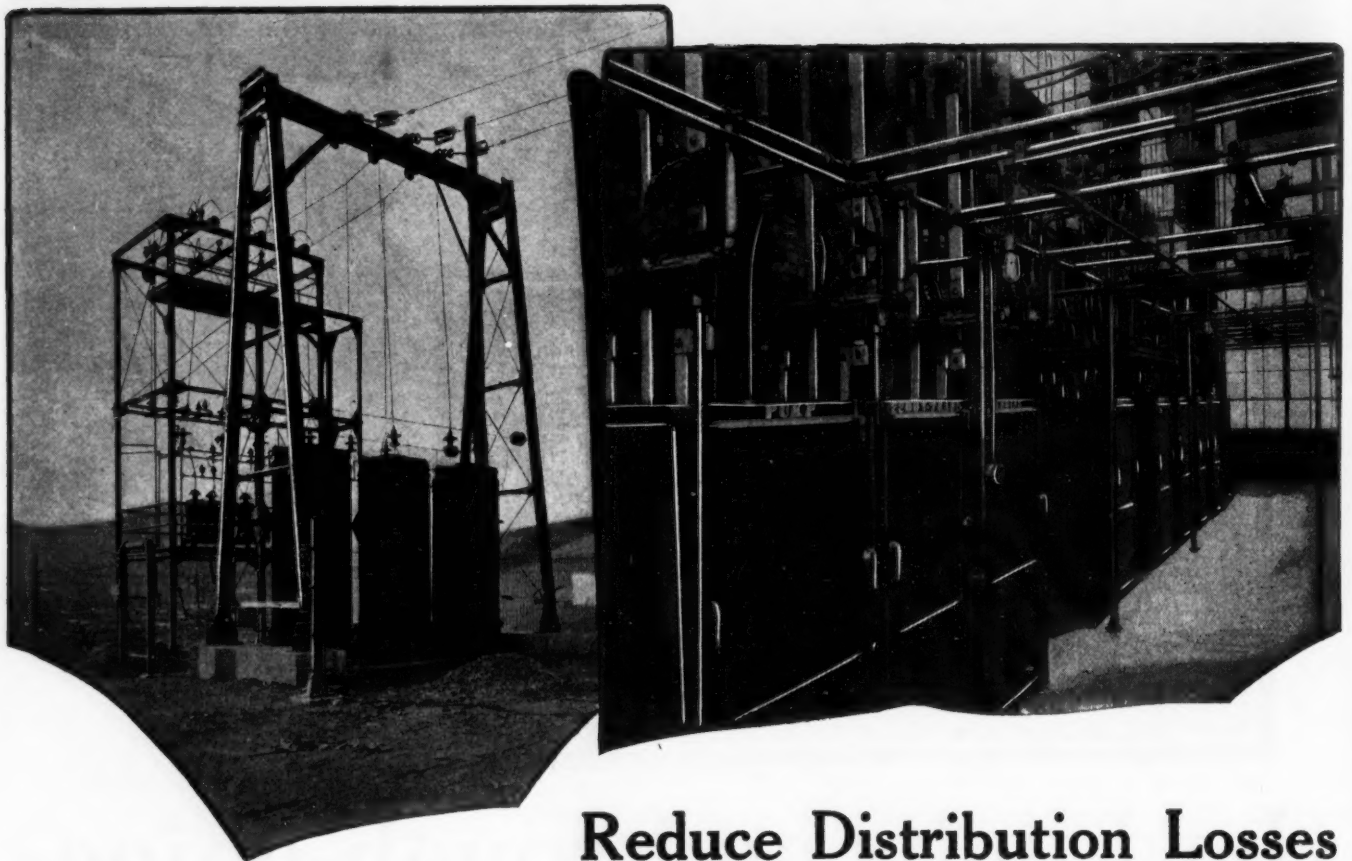
Chicago

Denver

Birmingham

HAZARD

Electrical Equipment



A Bank of 500 kv-a. G-E Transformers stepping down 6000 volts to 440 volts at a Pennsylvania coal operation. G-E Lightning Arresters protect the installation. Other view shows G-E Oil Circuit Breakers in the Mine Power House supplying this Receiving Station.

Reduce Distribution Losses with Modern Transmission Equipment

High-tension power distribution has rightly superseded direct-current power lines at modern coal operations, because of the well-known higher efficiency of alternating-current distribution.

The efficient transmission of energy from a central coal-mine power station to several mines requires modern, efficient, *dependable* equipment.

G-E Oil Circuit Breakers, Transformers, Lightning Arresters and other apparatus making up complete switching equipment insure continuity of service and the highest possible operating economy.

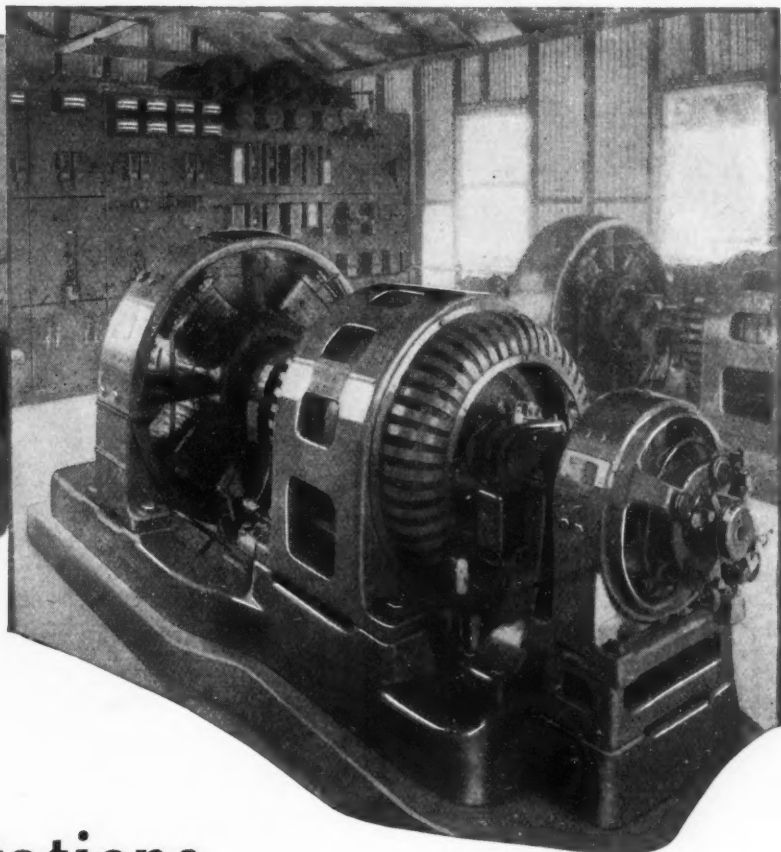
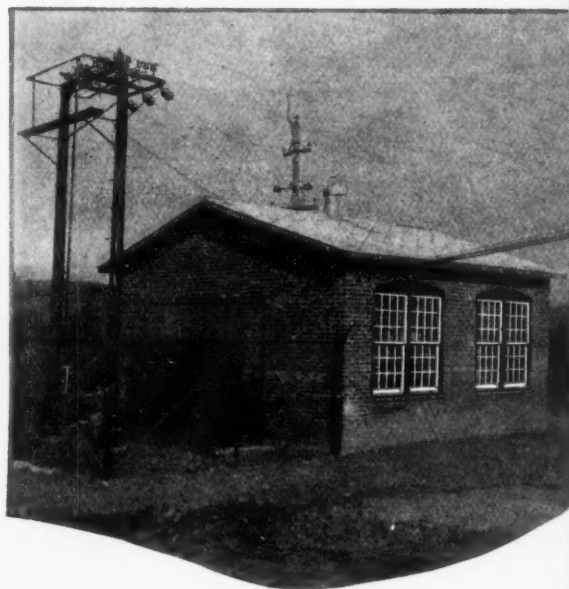
Specify "G-E".



General Electric Company
Schenectady, N. Y.

GENERAL

for Lower Costs per Ton



Automatic Sub-stations Maintain Power Supply and Increase Production

Direct-current mining equipment must have proper voltage to operate efficiently at full capacity. G-E Synchronous Motor-Generator Sets, Converters and Switchboards—or a complete G-E Automatic Sub-station

- improves power-factor to reduce line losses and make more power available.
- keeps voltage normal, which speeds up mining machines and locomotives
- insures against tie-ups and thereby helps you increase tonnage with present equipment.

The automatic sub-station is an established factor in reducing operating costs per ton.

G-E Automatic Synchronous M-G Set in a surface sub-station, "pepping up" direct-current voltage and correcting lagging power-factor.

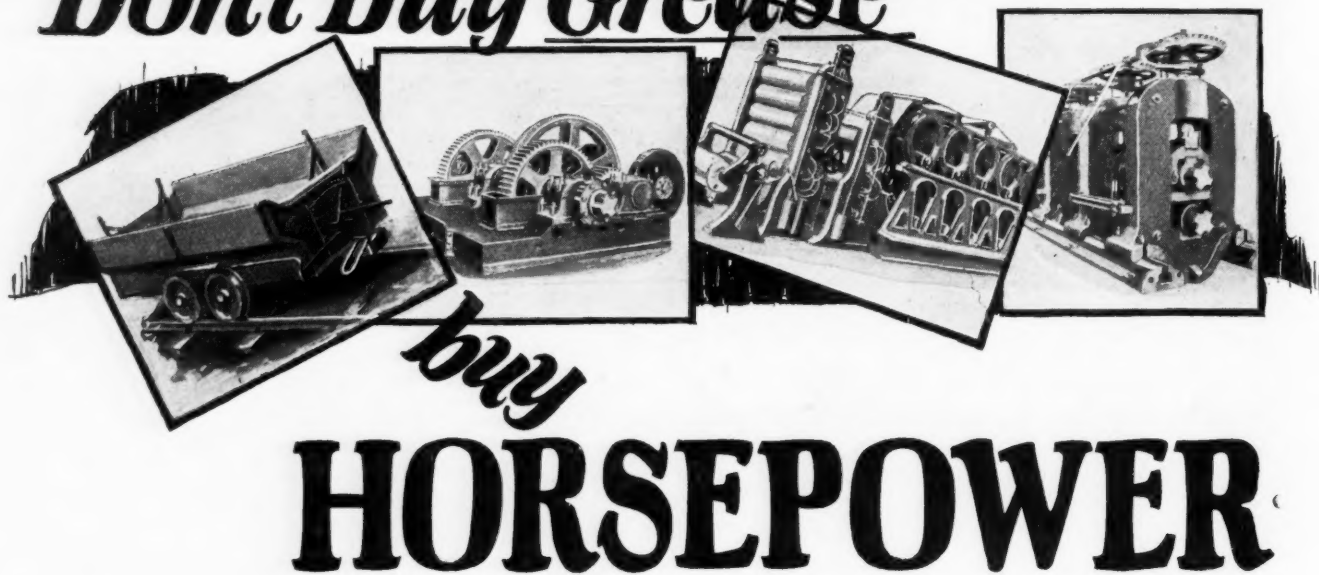


General Electric Company
Sales Offices in All Large Cities

ELECTRIC

54A-118

Don't Buy Grease



DID you ever look at it in that way? Correct lubrication means not only longer life, less friction, and cool bearings, but an actual reduction in the horsepower consumed. This represents a great saving to Industrial Plants.

WAVERLY GREASES will show a saving for anyone who will make a trial. Time and again we have actually proven to Mine Owners, Paper Mills, Rolling Mills, and all users of grease that WAVERLY GREASES, properly applied, will materially reduce power consumption.

It will cost you nothing to make this same test. We will ship you a barrel of grease which you may return at our expense and at no cost for the grease used if it does not perform satisfactorily according to our guarantee.

There is a Waverly Grease for every kind of machine—a grease that will save you horsepower. Don't buy grease—buy Horsepower.

Send for the Waverly Industrial Lubrication Booklet. It gives precise recommendations for oil and grease lubrication of all standard machines. Only book of its kind in print.

Waverly Oil Works Company

5401-54TH STREET PITTSBURGH, PA.

Established 44 years

Announcement

Waverly Mine Car Greases and Industrial Oils can now be had from Local Supply Dealers. These dealers are the logical channel of distribution for mill supplies. If your dealer does not handle Waverly Products and you would like to have him do so—write us.



**Gas Engine Oils
Air Compressor Oils
Turbine Oils
Engine Oils
Cylinder Oils
Steel Mill Greases
Paper Mill Greases
Special Greases**

*for
every conceivable
purpose*



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MEMBER OF NICE LEADERS OF THE WORLD ASSN.

MEMBER OF PENNSYLVANIA GRADE



CRUDE OIL ASSN.

Counting three and one-half millions of property dollars every day

We are frequently asked for the reasons why American Appraisals occupy their supreme position in the estimation of American business.

The outstanding reasons are the endeavor of The American Appraisal Company to make valuation work a science. As a result of its intensive and long experience, every working day three and a half millions of property dollars are now counted by means of American Appraisal Service.

This intensive daily experience deals with properties in every state in the union and abroad. Throughout these twenty-eight years of exclusive appraisal work American Appraisals have pioneered important advances in the making and application of appraisals for insurance purposes.

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Atlanta, Baltimore, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Indianapolis, Los Angeles, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, San Francisco, St. Louis, Seattle, Syracuse, Washington. The Canadian Appraisal Company, Ltd., Montreal, Toronto

INVESTIGATIONS

VALUATIONS, REPORTS — INDUSTRIALS, PUBLIC UTILITIES, NATURAL RESOURCES



An American Appraisal

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Designing, Superintendence, Construction. Everything for coal mines; Structures, Mechanical and Electrical Installations, Shaft Sinking, Development, Operation. Examinations-Reports-Appraisals. Isabella Bldg., Chicago.

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Consulting Mining Engineer Specializing in all problems Relative to Coal. Geological, Operating, Cost Analysis and Valuations. 1220-21 Union Trust Bldg., Cincinnati, O.

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Pittsburgh, Pa. Examination of Coal for By-Product Recovery, Investigations in By-Product Coke and Gas Manufacture, Ammonia, Tar, Benzols, Gasoline, Refractory Materials.

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Engineers—Constructors. Complete coal mine top works. Electrification of coal mines. Tipples, horizontal screens. Power generation and distribution. Send for catalog C. 730 West Monroe St., Chicago.

Longyear Company, E. J.

Mining Engineers. Shaft Sinking, Diamond Core Drilling and Manufacturing. Geological Surveys. Security Bldg., Minneapolis, Minn.

Means, The Charles M., Co.

Consulting Engineers. 39 Cortlandt St., New York. Oliver Bldg., Pittsburgh.

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Mining Engineer & Geologist. Coal land examinations and reports. Properties prospected, Surveys and Maps of all kinds. Over twenty years experience. Penna., Ohio, W. Va. and Ky. Oliver Bldg., Pittsburgh, Pa.

Porter, Horace C.

Chemical Engineer, Fuel Testing Coal Valuation and Tests, Ash Fusibility, Gas and By-Product Yields. Investigations at Mine or Plant. 1833 Chestnut St., Philadelphia

Godfrey M. S. Tait

Member Amer. Soc. Mechanical Engineers, Amer. Association of Engineers, Amer. Inst. Mining and Met. Engineers.

Consultations and Valuations on Coal Properties and Mines for Investment and Taxation.

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The Walter Engineering Corporation

Coal Mining Engineers

Examinations and Reports. Associates experienced in Financing, mergers, reorganization, consolidation, income-tax, modern mechanical mining and every phase of development, operation, distribution and marketing. 299 Broadway, New York.

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Consulting Electrical Engineer. Electrical Construction, Supervision, Examinations. 2327-28-29 Oliver Bldg., Pittsburgh, Penna.

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Designing and supervision of coal handling, preparation and storage equipment. Mine Structures, Mine Transportation, River Tipples and Harbors, Reports, Appraisals. 240 Capital St., Charleston, W. Va.

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Consulting Mechanical Engineer. Competent Engineering Assistance in Design and Construction of Coal Plants. 23 years Practical experience in Conveying Machinery, General Construction. Philadelphia, Pa. Schaff Bldg.

Wilson, Ridgeway R.

Mining Engineer Victoria, B. C. Canada.

DIAMOND CORE DRILLING FOUNDATION TESTING DIAMOND DRILLING & EXPLORATION CO.

C. C. Hoover, Pres.
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DIAMOND CORE DRILLING —CONTRACTORS— HOFFMAN BROS.

PUNXSUTAWNEY, PA.

(Our Specialty—Testing Bituminous Coal Lands)
Up-to-Date Equipment. Expert Drill Runners. Inquiries Solicited



BUFF

**Mining Transits
and Levels**

The "Buff" is the result of 50 years of instrument study by our Mr. Geo. L. Buff—our present manager. Send for Catalogue No. 23
Buff & Buff Mfg. Co., Jamaica Plain Stat'n, Mass.
Chicago, 231 No. Wells St.
Hudson Terminal Bldg., 46 Day St., New York

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Punxsutawney Drilling and Contracting Company DIAMOND DRILL CONTRACTORS

Testing Bituminous Coal Lands a Specialty

Weber Building
Established 1895

PUNXSUTAWNEY, PA.
Incorporated 1905

USE GENUINE "TOLEDOS"

FOR YOUR PIPE
THREADING and CUTTING JOBS

The Toledo Pipe Threading Machine Co.
Toledo, Ohio



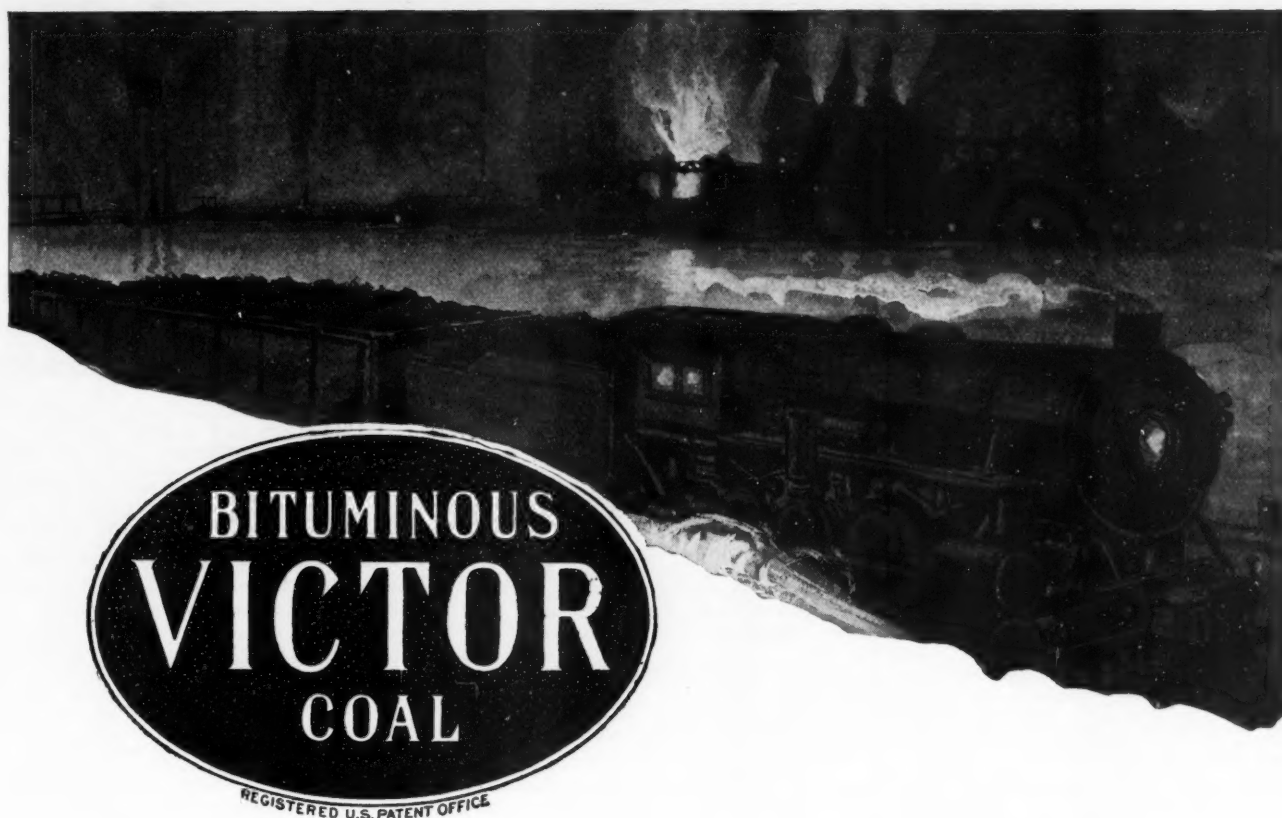
THE WORLD'S MOST RELIABLE DIAMOND-DRILL CONTRACTORS

SINCE 1884

SULLIVAN
122 SO. MICHIGAN AVE.

MACHINERY CO.
CHICAGO, ILL.





Mechanically Cleaned Semi-Bituminous Coal

We have installed at some of our mines and are equipping the remainder with a "PNEUMO-GRAVITY PROCESS," patented by us, by means of which any impurities are largely eliminated from our coals.

This process successfully *cleans from finest Slack to Lump* and the resultant product can be loaded together as R/M, or separately as Lump—Nut and Slack.

It is entirely and continuously mechanical in its operation, thus avoiding the human element, which has, heretofore, prevented the continuous and uniform elimination of impurities so absolutely essential in the maintenance of a high standard of preparation.

As no water is used in this process, as contrasted with wet washing methods, no additional freight charges are incurred by reason of excess moisture, nor difficulty encountered in unloading frozen coal during

winter months. The saving in freight and the increased boiler efficiency obtained, due to the low ash and sulphur content of "PNEUMO-GRAVITY" coal, is a net saving and of such importance as to warrant the scrutiny and consideration of every buyer of steam coal.

Produced in Central Pennsylvania Field, from mines in Clearfield, Cambria and Indiana counties; developed and mechanically equipped for an output of four million tons annually.

Shipping to New England and Middle Atlantic States, via New York Central Railroad, Pennsylvania Railroad, and their connections.

Tidewater deliveries at Canton Piers, Baltimore, Md., Port Richmond and Greenwich Piers, Philadelphia, Pa., Port Reading, South Amboy, Elizabethport, Port Liberty, and Pier 18, Jersey City, New York Harbor.

PEALE, PEACOCK & KERR

ONE BROADWAY, NEW YORK

NORTH AMERICAN BLDG., PHILADELPHIA, PA.

Operating Offices: ST. PENEDICT, PA., Cambria County

SEARCHLIGHT SECTION

USED EQUIPMENT & NEW—BUSINESS OPPORTUNITIES

UNDISPLAYED—RATE PER WORD:

Positions Wanted, 4 cents a word, minimum 15 cents an insertion, payable in advance.
Positions Vacant and all other classifications, 8 cents a word, minimum charge \$2.00.
Proposals: 10 cents a line an insertion.

INFORMATION:

Box Numbers in care of any of our offices count 10 words additional in undisplayed ads.
Discount of 10% if one payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

1 to 3 inches.....\$4.50 an inch
4 to 7 inches.....4.30 an inch
8 to 14 inches.....4.10 an inch
Rates for larger spaces, or yearly rates, on request.
An advertising inch is measured vertically on one column, 2 columns—30 inches—to a page.

C. A.

EMPLOYMENT AGENCIES

QUALIFIED office help. Do you need book-keepers, stenographers, typists, accountants, auditors? For twenty-six years we have been supplying office help to business concerns. Wire, write, or phone us your needs. Recommendations prompt and definite. Bowling Green Business University, Bowling Green, Kentucky.

POSITIONS WANTED

COAL mine manager—graduate engineer—fifteen years' executive training, modern methods; thoroughly versed on electrical-mechanical mining; will entertain offers from responsible companies; references. PW-524, Coal Age, Real Estate Trust Bldg., Philadelphia, Pa.

ELECTRICIAN and machinist wants position as mine superintendent or master mechanic; can furnish reference that would be satisfactory to the most particular manager. Address 212 Logan Ave., Morgantown, W. Va.

SUPERINTENDENT, available fifteen days' notice; ambitious, hustler, executive ability, excellent education; age 32, married, Protestant; prefer West Virginia or Kentucky; minimum salary \$350. PW-523, Coal Age, Real Estate Trust Bldg., Philadelphia, Pa.

BUSINESS OPPORTUNITIES

Man Wanted
with a capital of \$10,000, for good investment in coal proposition. Money guaranteed returned, with six per cent interest, in one year's time, if not satisfied. Write to BO-521, Coal Age, Real Estate Trust Bldg., Phila., Pa.

For Sale or Lease
223 acres of coal land, "E" vein. For particulars write to BO-519, Coal Age, Real Estate Trust Bldg., Phila., Pa.

For Lease
1,500 acres coal land. Lease for sale. Located in Western part of Kentucky. For particulars write to BO-520, Coal Age, Real Estate Trust Bldg., Phila., Pa.

ELECTRICAL MACHINERY

Reconditioned Like New—Guaranteed
New and used generators, motors, meters, switchboards and transformers.
Sold at prices far below original cost. America's largest stock; all kinds; direct current; alternating current; all standard makes. Tell us your requirements.
GREGORY ELECTRIC CO. Established 1893
16th and Lincoln Sts., Chicago, Ill.

WATER WORKS EQUIPMENT

- 17—New Roberts filter tubs, 17 ft. dia. x 7 ft. depth, capacity each 454 gallons per minute.
- 48—Used tubs, same as above.
- 5—14-in. Class B Worthington double suction enclosed impeller (volute) centrifugal pumps 16 in. suction 14 in. discharge.
- 3—Allis-Chalmers 14 in. Type S Centrifugal pumps.
- 6—Allis-Chalmers 16 in. Type S Centrifugal pumps.

Write for bulletin No. 22, Waterworks Equipment.

NASHVILLE INDUSTRIAL CORP.
Old Hickory, Tennessee

In Replying to "Blind" Ads

be careful to put on envelope the key number in the ad and also local address of office to which reply is sent.

712 Real Estate Trust Bldg., Phila.
10th Ave. at 36th St., New York.
359 Leader-News Bldg., Cleveland
1670 Old Colony Bldg., Chicago.
883 Mission St., San Francisco

Important

Original letters of recommendation or other papers of value should not be enclosed to unknown correspondents—send copies.

0195

ARCHER ARMSTRONG & CO.

Grand Central Terminal, New York City.

Phones: Vanderbilt 3282-10408

AIR COMPRESSORS

- 888-ft. Ing.-Rand XB2, with motor.
- 1192-ft. Ing.-Rand XB2, with motor.
- 1730-ft. Ch.-Pneum. OCE, with motor.
- 528-ft. Ing.-Rand FRI, steam driven.
- 888-ft. Ing.-Rand Imp.X, steam driven.
- 1955-ft. Ing.-Rand XPV-3, steam driven.

(New TRAYLOR Air Compressors)

HOISTS

- (New CLYDE elec. gas and steam. Also derricks)
- 2—112-hp. Flory SD shaft hoists.
- 2—150-hp. Flory SD shaft hoists.
- 1—200-hp. Vulcan DD shaft hoist.
- Above complete with motor equipment.
- 1—5-ton Westinghouse-Baldwin electric trolley locomotive, 36 to 42-in. gauge, 220 v., D.C.
- 2—8-ton same as above.

SCALES

Write for Bulletin No. 20, listing 10 tons, 15 tons, 60 tons and 100 tons Platform Scales.

NASHVILLE INDUSTRIAL CORPORATION
Old Hickory, Tennessee

BARGAINS

**MOTOR GENERATOR SETS
ENGINE GENERATOR SETS
MINING MACHINES
MINE LOCOMOTIVES**

DUQUESNE ELECTRIC & MFG. CO.
Pittsburgh, Pa.

"HONESTLY REBUILT"

150 kw., 250 v. D.C. Gen'l Elec. 3 ph. 60 cy., 2300 v. A.C., 900 r.p.m. "Ft. Wayne" synch. Motor Generator.

200 kw., 250 v. D.C. Gen'l Elec. 3 ph., 60 cy., 2300 v. A.C., 1200 r.p.m. synch. Motor Generator Set.

300 kw., 250 v. D.C., 3 ph., 60 cy., 2300 v. A.C. Gen'l Elec. coupled type synch. Motor Generator Set. Price. \$3825

MILLER-OWEN ELECTRIC CO., Inc., Pittsburgh, Penna.

BOILERS AT LOW COST

- 12—823 hp. Babcock & Wilcox Stirling Water Tube Boilers, Class M-30, 200 lbs. pressure. Westinghouse stokers and all accessories.
- 2—300 hp. Heine boilers, 150 lbs. pressure. Murphy stokers and accessories.

Write for list of Power House Equipment.
NASHVILLE INDUSTRIAL CORPORATION
Old Hickory, Tennessee

- 1—35 hp., 250 volt D.C. Burke Motor, 1200 r.p.m. complete. Price, \$400.00.
- 1—20 hp. 550 volt Crocker Wheeler 690 r.p.m. D.C. complete. Price, \$250.00
- 1—150 hp. 750 r.p.m. Bullock, 500 volt complete, comp'd wd. Price on application.

Superior Electric & Manufacturing Co.
Pittsburgh, Pa.

PUMPS

- 10—25 and 38x4 4/5x24 Worthington Tandem Compound Duplex Pumps.

Write for list of 200 pumps,
2 1/2-in. to 16-in. sizes.

NASHVILLE INDUSTRIAL CORPORATION
Old Hickory, Tennessee

WAGON LOADER

- 1—Haise, in first class condition without motor.

HOISTING MACHINERY COMPANY.
50 Church Street, New York

"SEARCHLIGHT" RATES

Coal Age

UNDISPLAYED:

Positions Wanted—4 cents a word, minimum charge—75 cents an insertion.

Positions Vacant and other classifications—8 cents a word, minimum charge \$2.00 an insertion. Allow 5 words for box address.

No additional charge for forwarding replies. Discount of 10% for payment in advance on 4 consecutive insertions of undisplayed advertisements.

Proposals—40 cents a line.

DISPLAYED:

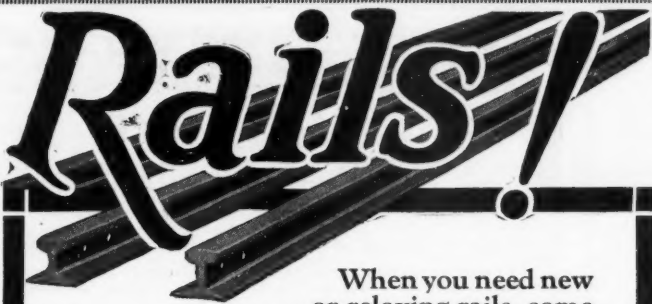
Space is sold by the "inch," with 30 inches to a page. (An "inch" measures approximately 1 inch high by 2 1/4 inches wide.) Rates are from \$4.50 to \$3.50 an inch, depending on the total space used.

0226

ELECTRICAL MACHINERY

Stock Bulletin No. 101 Mailed on Request

- Meade-Morrison Friction Hoist, drum 12x15-in., motor 7 1/2 hp. A.C. or D.C.
- Meade-Morrison Friction Hoist, drum 12x15-in., motor 15 hp., A.C. or D.C.
- Clyde Friction Drum Hoist drum 16x20-in., motor 25 hp. D.C.
- Clyde Friction Drum Hoist drum 16x20-in., motor 30 hp. A.C.
- Clyde Friction Drum Hoist drum 16x20-in., motor 40 hp. D.C.



When you need new or relaying rails, come to headquarters and get just what you want, in any quantity, and get them quick.

We always have a big stock of rails, from 12 lbs. to 100 lbs. per yard, for immediate delivery. Every rail inspected and guaranteed. Complete with the necessary angle bars.

When it comes to price we are also headquarters—we have complete stocks of new and relaying rails of all weights available for prompt shipment located in thirty convenient distributing points throughout the United States, Canada and Cuba—which in turn means we can make immediate shipments at unbeatable prices to our customers. "Tons of Rails Right at Your Door." Write, 'phone or wire us your requirements.

HYMAN-MICHAELS COMPANY
"The House of Dependable Service"

122 South Michigan Avenue, Chicago

Dealers in New and Relaying Rails,
Locomotives and Railway Equipment

District Offices: New York, Woolworth Bldg.; St. Louis,
Railway Exchange Bldg.; Pittsburgh, First Nat'l Bank Bldg.;
Detroit, Book Bldg.; San Francisco, 234 Steuart St.

Yards: St. Louis, East Chicago, Ind., McKee's Rocks, Pa.,
San Francisco.

Cable Address: "Hymanmikel"

World's Largest Distributors of Rails

UNAFLOW UNIT

240 kva. General Electric 3 ph., 60 cy.
dir. con. Ames Unaflow Engine. Practi-
cally new, \$5500.

4 VALVE UNIT

125 kva. General Electric 3 ph., 60 cy.
Alternator, dir. con. 17x18-in. Harris-
burg late type, 4-valve engine. Two
years service. Practically new, \$2500.

4 VALVE UNIT

312 kva. General Electric 3 ph., 60 cy.
dir. con. 19x20 Erie Ball 4-valve
engine, 2 years service, \$5500.

3 WIRE UNITS

2—200 kw. Westinghouse, 250-125 v.
dir. con. Monarch Heavy Duty Corliss
Engine: \$3500. 300 kw. Ditto: \$4750.

Power Machinery Exchange
1 Montgomery Street, Jersey City, N.J.

RAILS

New Relaying

FROGS
SWITCHES
SPICE BARS
BOLTS
NUTS
TIE PLATES
RAIL
BRACES

All Rails and
Track Mate-
rials shipped
subject to in-
spection and
approval at
destination.

L. B. Foster Co.

PITTSBURGH-PA
NEW YORK

ELECTRICAL EQUIPMENT

125—Motors 1/4 to 150 hp.
22—Type H No. 211982 (W) oil circuit
breakers.

Write for Bulletin 21 listing large stock
of motors, generators, transformers, con-
dulets, panels, switches, etc.

NASHVILLE INDUSTRIAL CORPORATION
Old Hickory, Tennessee

RELAYING RAIL

All sections carried in stock. Large and small
orders filled promptly.

NEW AND SECOND-HAND MINE CARS

Carried in stock of most all gauges. Also a quan-
tity of 36 and 42-in. gauge, new and second-hand
mine cars on hand. Prices cheerfully quoted.

M. K. Frank, Union Trust Bldg., Pittsburgh, Pa.
New York Office, 15 Park Row Bldg.

RAILS

Complete stock, all section Relaying Rails.
Get in touch with us by 'phone or wire for
your requirements.

LOUIS COHEN & SON, Wilkes-Barre, Pa.

Get Our Prices. A Stamp May Save Dollars

NEW RAILS RELAY

FROGS AND SWITCHES
TRACK ACCESSORIES

MORRISON & RISMAN CO., INC.
Buffalo Cleveland

RAILS NEW AND RELAYERS

All Sections and Weights in Stock.
Fine lot 70 lb. A. S. C. E. Rails.
Immediate Shipment

NATIONAL STEEL RAIL COMPANY
Planters Bldg., St. Louis, Missouri
Phones: Olive 563 and 1259

RAILS

NEW and RELAYING

Car Load and
Smaller Lots
Shipped
Immediately
From
Baltimore, Md.
Jacksonville, Fla.
Warehouses



WC BRIDGELL CO. INC

Baltimore, Md.

Mining Machines and Locomotives

250 Volt D.C.

2—35-B Jeffrey, 6-ft. Cutter Bar, 36-in. Gauge
on drop axles.

3—12-A Goodman, 5-ft. Cutter Bar, 36-in. Gauge
drop axles.

22—Other Mining Machines, 15—Locomotives,
Pumps, Hoists, etc.

Largest stock in Pittsburgh or vicinity.

Write for prices.

J. N. MYERS & ASSOCIATES

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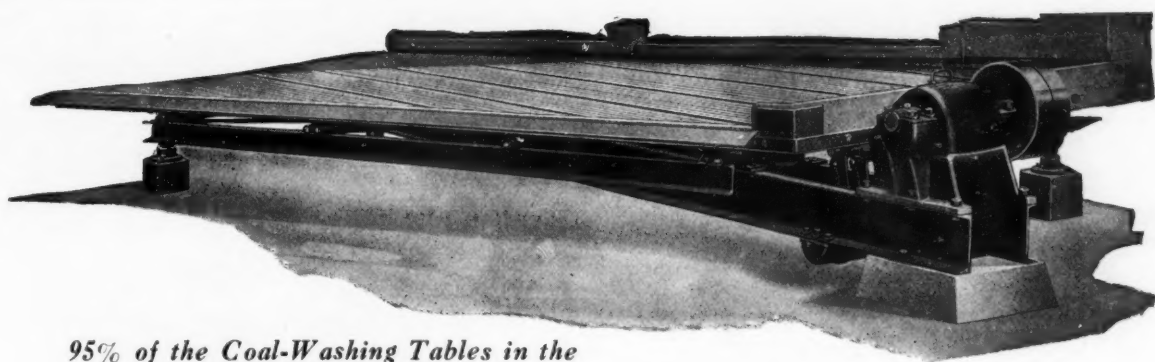
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Diagonal-Deck

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*"Built to Carry On"***ROBINS**

Cut off Gates
Single and Duplex Types in
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Rugged in Construction,
Easy to Operate,
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RHEOLAVEUR

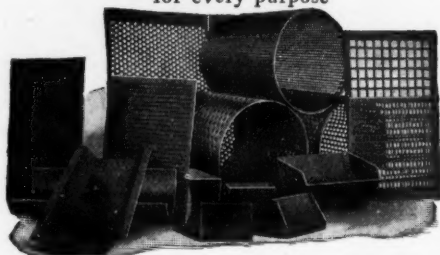
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Built for washing all coal up to 4-in. sizes—both anthracite and bituminous. All manufacturing and patent rights owned and controlled by A. France Focquet, 17 Quai St., Léonard, Liège, Belgium. For particulars address

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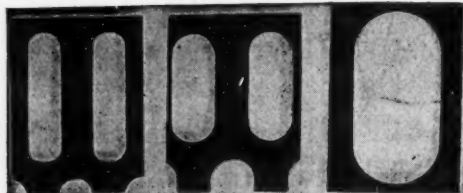
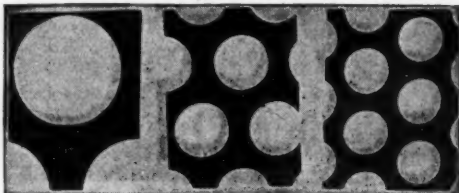
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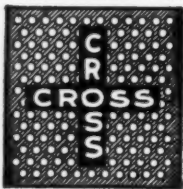
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Tipples and Equipment

The illustrations picture a FAIRMONT TIPPLE EQUIPMENT installation at the plant of the Draper Eagle Coal Company, Logan, W. Va., designed for a capacity of 300 tons per hour. The seams of coal are worked at different elevations;—Coal is loaded into Rope and Button Conveyors,—carried to tipple where it is passed over shaker screens and loaded over loading booms into railroad cars.

Let us send you the Fairmont Tipple Equipment Bulletin

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Miners Safety Lamps

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Find out why*



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Over 11,000 Satisfied Users!

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Belt driven

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Write us for Prices and Terms.

LITTLE GIANT COMPANY
102 Rock St., Mankato, Minn.

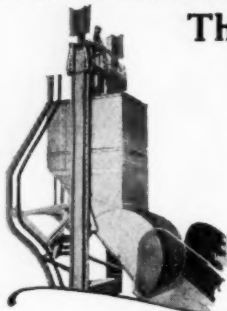
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Motor driven

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The Non-Tilttable Skip



The New Model Hoist Skip which discharges from the bottom of bucket. Never spills. Positive in action. Big capacity.

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"U.S." CONVEYOR BELTING

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(255)



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*Miners Cap Lamps
Approved Safety Lamps
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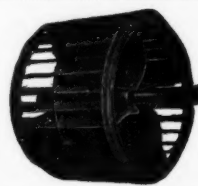


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Adaptable to any
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The Correct weight— for every car

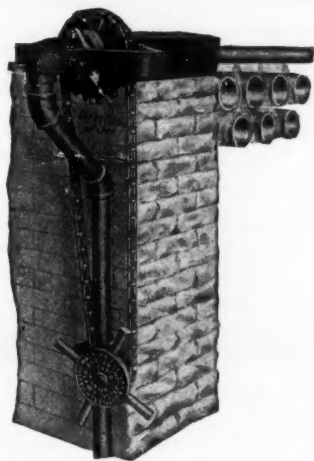
Careless, slipshod hand weighing at the tippie is an economic waste which means loss to both miners and operators.

The Streeter-Amet weighing and recording attachment eliminates these losses. It records the *correct* weight instantly. Miners are better satisfied because this machine cannot fail to record all tonnage mined. Operators know it eliminates all overpayments. Write for details.

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Clean Boiler Tubes Pay Dividends

Keep Tubes Clean with
Marion Soot Blowers

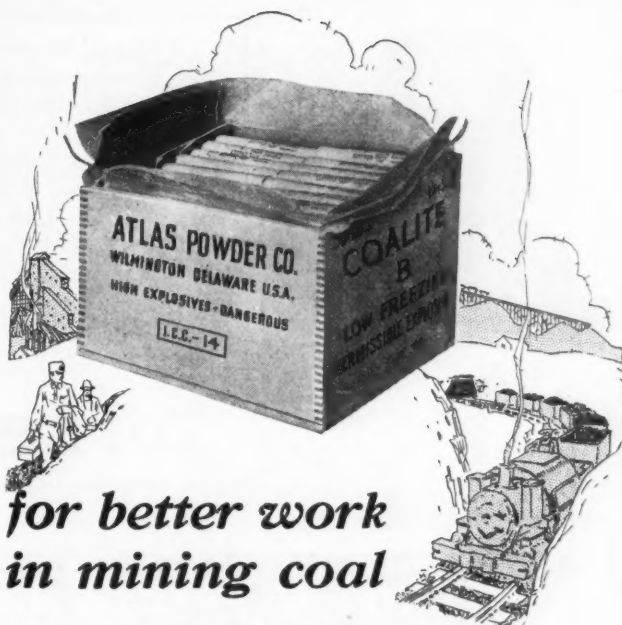


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*for better work
in mining coal*

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Write for
a copy of
the new
Atlas
catalog.

Let the Atlas Service Man help you in determining what grade of Coalite is best adapted to the requirements of your work.

ATLAS COALITE

The permissible explosive packed in white paper cartridges

ATLAS POWDER COMPANY

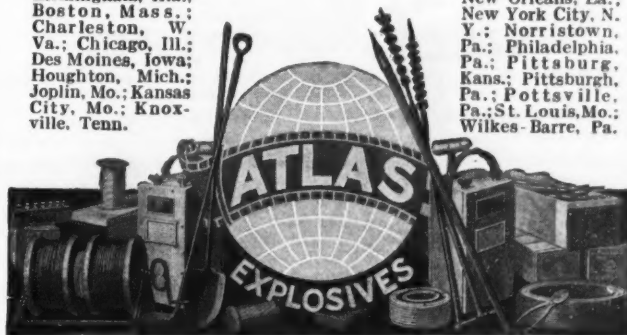
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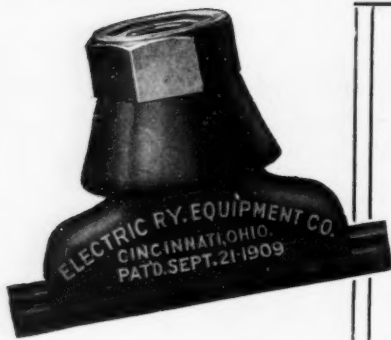
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Sure-Grips



AETNA COMMUTATOR SMOOTHING STONES



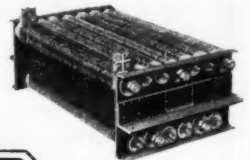
Practical and serviceable! Keep motors and generators in good condition. Pressed on the commutator while the machine is in service, Aetna Stones will take the rough spots out of the copper and automatically undercut the mica.

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Acid-Proof Wood Pipe for mine water



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An Absolutely Tight Durable Pipe

Fully 50% stronger than Straight Riveted Pipe of equal thickness. Light weight and simplicity of bolted connections results in low handling and installation expense. Suitable for Conveying Water, Air, Gas, Exhaust Steam and Wood Pulp.
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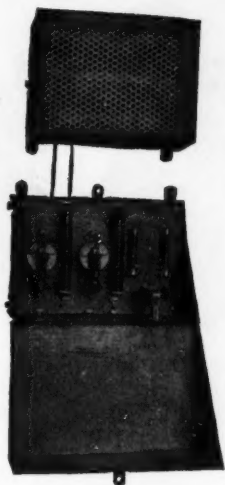


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36 Cents Per Year Per Starter For Maintenance



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¶ For 200 type "SS" Automatic Motor Starters installed on mine pump motors over a period of two years, there was purchased only \$72.44 worth of repair parts during that time. The average length of time these Starters had been in service was one year. \$72.44 divided by 200 is 36 cents.

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Maintenance cost on type "SS" Automatic Motor Starters is low because they are built of good stuff and plenty of it to begin with.

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THE AUTOMATIC RECLOSING CIRCUIT BREAKER CO.

Columbus, Ohio, U. S. A.

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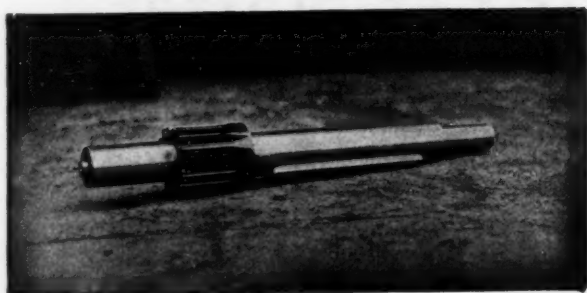
Where wood outlasts steel

It is *corrosion* that shortens the life of steel tanks and makes necessary inside and outside painting every year. Hauser-Stander Wood Tanks never corrode. They require no inside painting and so are never out of service. They last 30, 40 and even 50 years, with only a minimum of repairs. Send for booklet.

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Does This Pinion Give You Trouble?

Do you have continual expense because of wear or breakage on this pinion?

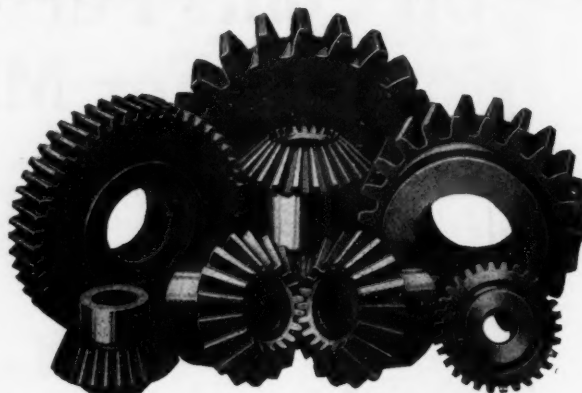
If you do, ask us about our new design with a modified tooth shape that wears very slowly and does not break.

We have absolutely solved the problem presented by this pinion.

*The standard of Quality
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We make gears for every type of mining machine, mine locomotive pump, hoist. Our B.P. quality gears are guaranteed to last four times as long as ordinary gearing.

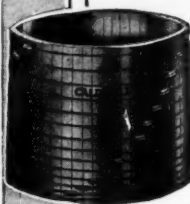
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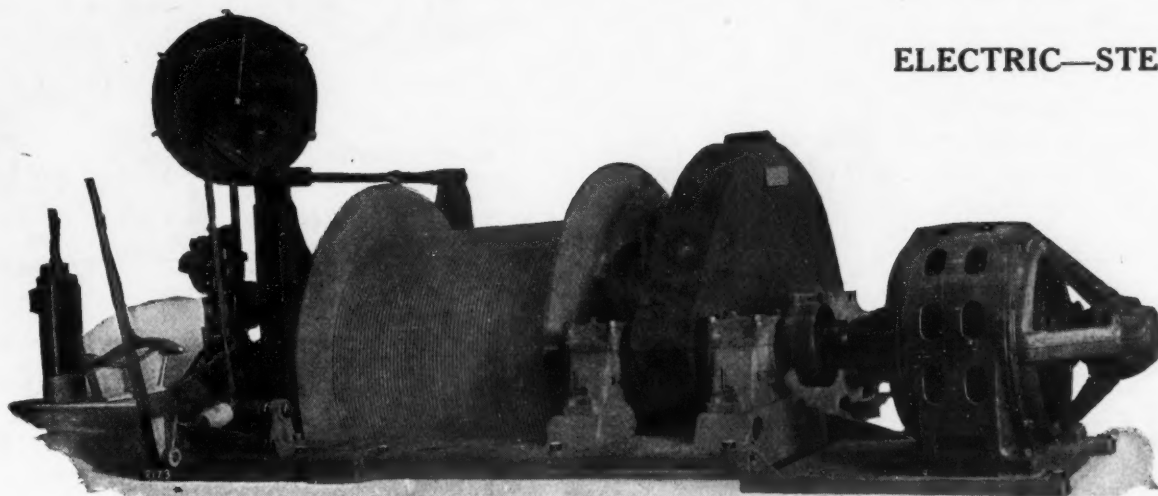
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Uniflow Engines - Corliss Engines - Diesel Engines
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MILWAUKEE WISCONSIN

LIDGERWOOD MINE HOISTS

ELECTRIC—STEAM



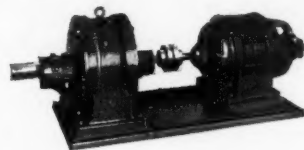
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Heavy lowering duty of 17,250 lbs. Drum holds 11,000 feet rope.

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Manufacturers of Spur and Worm Gear Speed Reducing Transmissions, also Spur, Bevel, Mitre, Worm, Internal, Helical and Tractor Gears, Rawhide and Bakelite Pinions—Racks.



All gear transmission problems solved on short notice

Coal operators will find it to their advantage to entrust all their gear and speed reducing problems to James. For 20 years James has been recognized in many industrial fields as reliable gear specialists. The reason for this compliment is James' facilities for prompt and satisfactory handling of miscellaneous gear work.

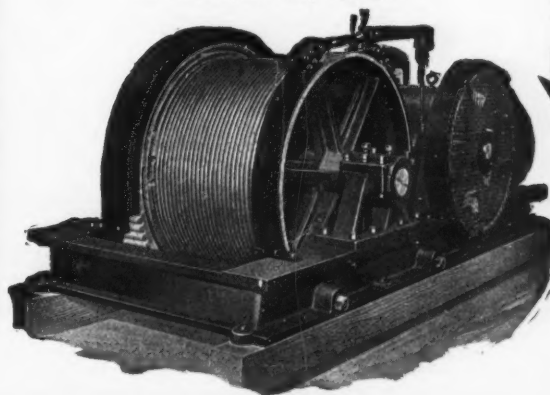
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For Counterbalanced Shaft or Slope Hoisting

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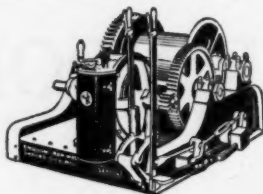
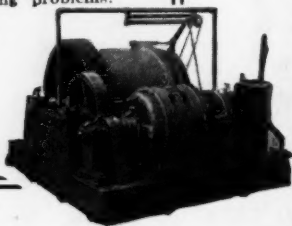


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Ottumwa Hoists comprise a line which completely covers the requirements of coal mines. Ottumwa Engineers are always available for consultation regarding hoisting problems.

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Hoists, Mine Cars, Sheave
Wheels and Rollers and
Roller Bearing Trucks.



Electric Hoist

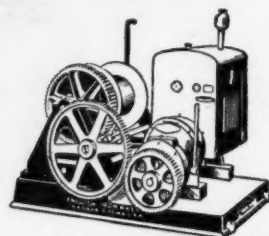
Hoists for every class
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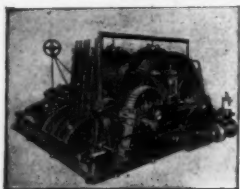
Kansas City, Mo., U. S. A.

"SAMSON"

Electric Hoists
Gasoline Engine
Hoists



4-Cylinder Engine Hoist



FLORY HOISTS
STEAM—ELECTRIC
GASOLINE

for every requirement

S. Flory Manufacturing Co.
95 Liberty St., New York. Bangor, Pa.

ALLIS-CHALMERS

MILWAUKEE, WIS. U. S. A.

Power and Electrical Machinery, Mining Machinery, Pumping Engines, Centrifugal Pumps, Crushing Machinery, Steam and Electric Hoists, Power Transmission Machinery, Timber Treating and Preserving Machinery, Air Compressors.

Decrease Haulage Costs
— WRITE FOR CATALOG —
Geo. D. Whitcomb Company
ROCHELLE — ILLINOIS
SEE OUR ADVERTISEMENT IN THE FIRST ISSUE OF EACH MONTH.

HERRINGBONE CUT GEARS
MILL DRIVES **FAWCUS** 3PUR WORM BEVEL GEARS
SPEED REDUCERS
FAWCUS MACHINE CO. PITTSBURGH, PA.

ATLAS
Mine Locomotives
THE ATLAS CAR & MFG. COMPANY
CLEVELAND, O. Engineers Manufacturers

ALDRICH
Write for Catalogue Department 9
THE ALDRICH PUMP CO.
Allentown, Pa.

PLYMOUTH
Gasoline Locomotives
For Mine and Industrial Haulage
Ask for Bulletins
THE FATE-ROOT-HEATH CO.
Plymouth, Ohio, U. S. A.

A BOX OF CIGARS!
We will give a box of cigars to the engineer operating the oldest McEwen or Ridgway Engine. Give engine number, history, and be sure your reply reaches us not later than July 26.
Ridgway Dynamo & Engine Co.
7016 Euclid Ave., Cleveland, Ohio

WHEN buying a locomotive consider Quality, Long Life—then investigate the advantages a PORTER offers.
Bulletins on Request
H. K. PORTER COMPANY
Established 1865 PITTSBURGH, PA.

THE IRONTON
STORAGE BATTERY LOCOMOTIVE
The Ironton Engine Co.
Ironton, Ohio

EFFICIENT, economical hauling. Find out about storage battery locomotives for your hauling. The Ironton is the best storage battery locomotive.

Mancha's Electric Mule
Mancha Storage Battery Locomotive Co.
St. Louis, Mo.
Representatives In All Principal Cities



Have You the Right Type of Locomotive?

TRANSPORTATION costs will always be high unless the locomotives employed are perfectly suited to mining conditions. The Shay Geared Locomotive meets every haulage requirement of the mining and stripping operator.

The Shay works on lighter rail and rougher track than a rod-driven engine of the same power. The Shay hauls loads up grades that would stop a rod engine. The Shay stays on the track at curves that invariably derail the rod engine.

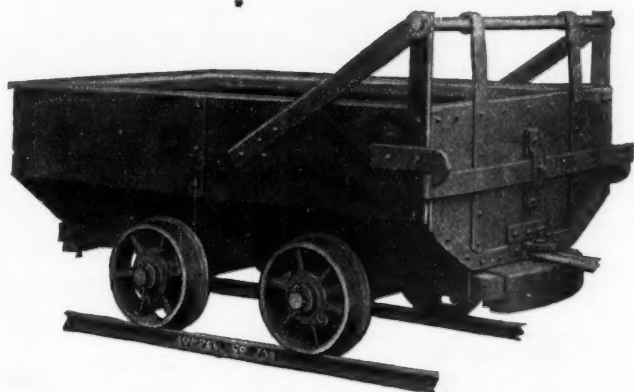
Shay Geared Locomotives have many money-saving features that will help you reduce transportation costs. Write for details.

LIMA LOCOMOTIVE WORKS, Incorporated

17 East 42nd Street, New York

Lima, Ohio

Do you specify "KOPPEL"?



If not, let us show you the kind of equipment we are making for some of the country's largest operators—equipment that saves them cost, in lower upkeep and longer life.

Headquarters for

Frogs	Rails
Switches	Cars
Ties	Track
Turntables	

A big stock always on hand



KOPPEL INDUSTRIAL CAR AND EQUIPMENT COMPANY
KOPPEL, PENNA.

Sales Offices:

New York

Pittsburgh

Detroit

Chicago

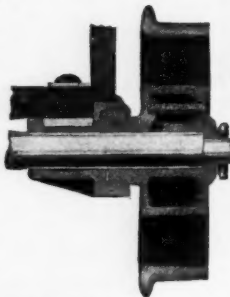
Is easily applied with a few large bolts

Is seldom shopped on account of truck trouble.

Holds lubricant for long periods.

Is guaranteed for a year against hub wear.

Has full-floating axles with visible linch pins.



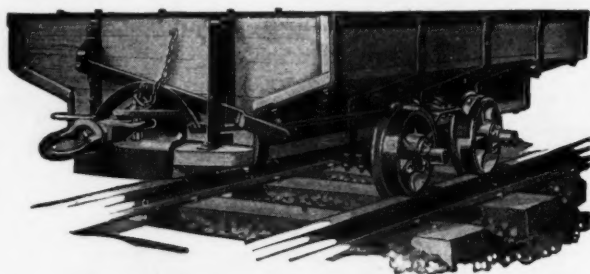
PHILLIPS

Patent Open Cap Wheel Truck

This Truck is the ideal running-gear for large or small mines, light or heavy cars, animal or mechanical haulage. It will solve that problem of hard-running cars—on level track it runs 25 per cent easier than other improved trucks selling at the same price.

Write us today.

Phillips Mine & Mill Supply Co.
So. 23rd and Jane Sts., Pittsburgh, Pa.



We shipped Watt Cars to northern Canada 14 years ago—had hard service and now they are bringing them back to the states for another mine operation.

IT PAYS TO BUY
WATT CARS
"The Best"

The
WATT
MINING CAR
WHEEL CO.
Barnesville,
Ohio

SELLING "WATT QUALITY PRODUCTS"

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San Francisco, Cal.—N. D. Phelps, Sheldon Bldg.
Huntington, W. Va.—J. E. Graham, 412 Sixth Ave.
Chicago, Ill.—W. W. Baker, 140 South Dearborn St.
Denver, Colo.—Lindrooth, Shubart & Co., Boston Bldg.
Birmingham, Ala.—C. P. Leibold, 1318 South 20th St.

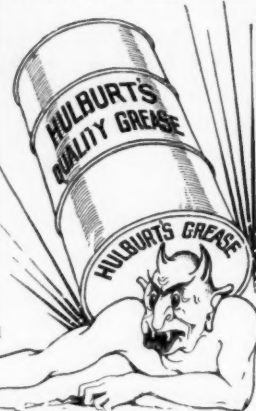
HULBURT'S

Mine Car Grease
Mining Machine Lubricant
Locomotive Lubricant
Wool Yarn Elastic Grease
Cup Greases
Cable Grease
Mechanical Loader Grease

HULBURT OIL & GREASE CO.,
Specialists in Coal Mine
Lubrication.

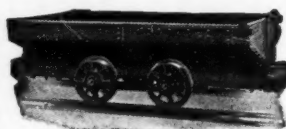
Gen'l Offices & Works: Phila., Pa.
Distributing Points
Throughout Coal
Mining
Fields.

Drive out the Friction Devils.



THE LORAIN STEEL COMPANY

Johnstown, Pa.



Manufacturers of Steel and
Composite mine cars, and all
kinds of mine track work.

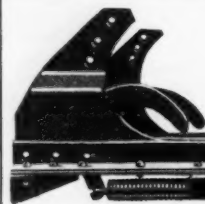
Sales Offices:

Atlanta	Chicago	Cleveland	New York
	Philadelphia	Pittsburgh	
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United States Steel Products Company			
Los Angeles	Portland	San Francisco	Seattle
Export Representative:			
United States Steel Products Company, New York, N. Y.			

Standard in 75% of Mines

"Superior" Bit Steel and
Finished Bits assure superior
performance. All sizes and
types. Uniform in quality
and finish. Our guarantee
of performance and service
life is worth investigating.

Pittsburgh Knife & Forge Co.
Coraopolis, Pa.



HELMICK
FOUNDRY & MACHINE CO.
FAIRMONT, WEST VA.



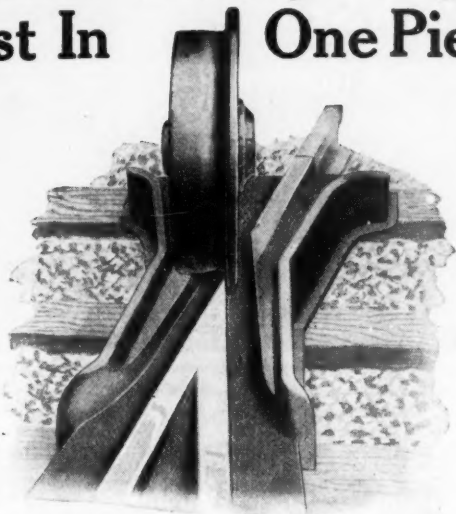
**Roll Back
Dump**
Eliminates Shock
Send for Bulletin



Steam Turbines, for all speed and steam conditions. Catalog D71.
Double Helical Speed Reducing Gears. Catalog G71
Centrifugal Pumps, for all capacities. Catalog B71
Centrifugal Blowers and Compressors. Catalog F71

De Laval
Steam Turbine Company, Trenton, N.J.

REID Safety Frog Cast In One Piece



Trucks pass over the Reid Safety Frog as smoothly as over continuous rail. There is no jolt and consequent damage either to frog or rolling stock. This saving of wear and tear on cars alone is but one reason for the superiority of these safety frogs.

It is as easy to lay the Reid Safety Frog as it is to lay a rail. The frog is all in one-piece and once in place, cannot become loose or twisted out of line.

We now make these frogs with rail extensions for bolting to the rails.

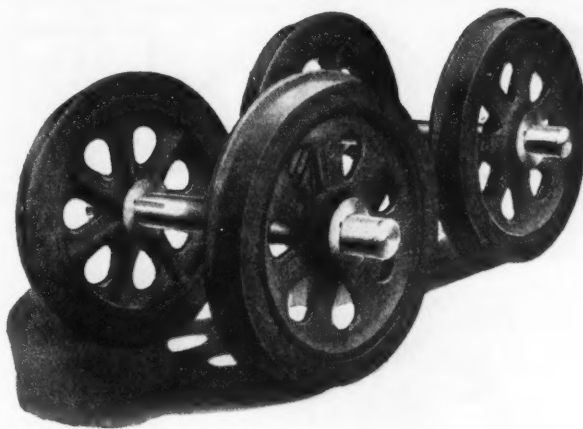
Send for complete description of this valuable equipment.

Egyptian Iron Works

"Dept. C. A."

Murphysboro, Ill.

LOBDELL Car Wheels



Built for Service

The unusual wear resisting quality of Lobdell Wheels is due to the special Lobdell Heat-treating Process. It builds strength and long service right into the wheel. It makes the thread hard and resistant to wear, the spokes and hub strong and resistant to strains and shocks.

A smooth-rolling wheel reduces the wear on locomotives, cars and track, reduces maintenance and repair costs—it pays for itself many times over. That's why it's real economy to invest in Lobdell Wheels.

*Begin Now—
Send us your next order.*

LOBDELL CAR WHEEL COMPANY

Established 1836

WILMINGTON, DELAWARE.



OHIO Grease

HOT BOXES

—are unheard of when wheels are lubricated with Ohio Mine Car Grease. Suitable for wheels of every kind. The one ideal lubricant for reservoir or cavity type wheels whether plain, roller or ball bearing.

Unaffected by weather. Low cold test —long lasting—the perfect lubricant for mine car wheels.

A free bulletin and generous sample will be sent free on request.



The Ohio Grease Company
Loudonville, Ohio



I MAKE
THE WONDERFUL AUTOMATIC
DROP-BOTTOM MINE CAR

ALSO OTHER MINE CARS
AND THE "WHITNEY WONDER"
ROLLER BEARING TRUCKS.

TRY Mr. SANFORD-DAY
KNOXVILLE TENNESSEE

THE S&D GRIFFITH
PAT'D
DROP-BOTTOM CAR

1000 STYLES

S-D
WHITNEY-
WONDER WHEEL

S-D
PAT'D
"MOGUL" WHEEL



**Equip Your Mine
With Steel**

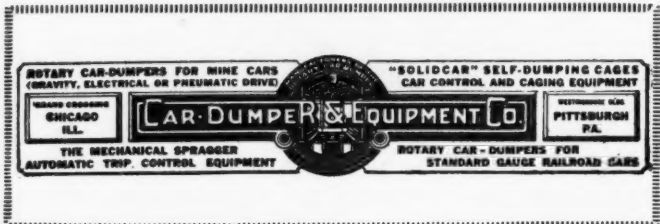
Steel Mine Timbers
Steel Cross Ties
Wheels-Axles
Rails-and
Accessories

Carnegie Steel Company
PITTSBURGH, PENNA.



**Complete Cars
Trucks of all Types**

Builders of the Hollow Axle Truck
SOUTHERN WHEEL COMPANY
ST. LOUIS, MO. BIRMINGHAM, ALA.



ROTARY CAR-DUMPERS FOR MINE CARS
(GRAVITY, ELECTRICAL OR PNEUMATIC DRIVE)

CHICAGO
ILL.

CAR-DUMPER & EQUIPMENT CO.

WESTINGHOUSE BROS.
PITTSBURGH
PA.

THE MECHANICAL SPRAGGER
AUTOMATIC TRIP CONTROL EQUIPMENT

"SOLIDCAR" SELF-DUMPING CAGES
CAR CONTROL AND CAGING EQUIPMENT

ROTARY CAR-DUMPERS FOR
STANDARD GAUGE RAILROAD CARS



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TROLLEY WIRE**

ANACONDA COPPER
MINING COMPANY
Conway Building, Chicago, Ill.

THE AMERICAN
BRASS COMPANY
General Office: Waterbury, Conn.



**SWEET'S
Track Materials**
The World's Standard for over 20 Years
Sweet's Steel Co. • Williamsport, Pa.



**"Durabil" Steel
Frog**


**L. A. GREEN RAILWAY
EQUIP. CO.**

Rails and Mine Equipment
Established 1902
First National Bank Bldg., Pittsburgh

One-piece
Titanium Steel



**The
West Virginia Rail Co.**
Manufacturers
Light Steel Rails
8-12-16-20-25-30-35-40-45-50-lbs. per yd.
Frogs & Switches—Steel Mine Ties
Huntington, W. Va.

LIGHT STEEL RAILS

8, 12, 16, 20, 25, 30, 35, 40 lb. per yard
Splices, Spikes, Frogs and Switches

UNITED STATES RAIL CO.
CUMBERLAND, MARYLAND



NEW and RELAYING RAILS
1 TON OR 1000

TRACK
EQUIP-
MENT

L.B. FOSTER CO.
PITTSBURGH - PENNSYLVANIA

RAIL
ACCESS-
ORIES

NEW YORK - JERSEY CITY - PHILADELPHIA - HAMILTON, O.



**THE
LSON** SELF
DUMPING CAGE

Adopted By Leading Coal Companies
As Standard Equipment
EAGLE IRON WORKS, Des Moines, Iowa



That Haul From Tipple to Siding—
A one man machine and a steady movement of coal when using the
AUTOMATIC AERIAL TRAMWAY—
Assures economical operation and takes you a long step towards profits.
Put your hauling problem up to us.

Interstate Equipment Corporation
25 Church Street, New York City



Put it up to us

One of the things which have contributed to the high standing of "Cincinnati" Track Equipment throughout the coal fields is the service behind it. No matter what your requirements or problems "Cincinnati" experience and "Cincinnati" facilities are at your service.

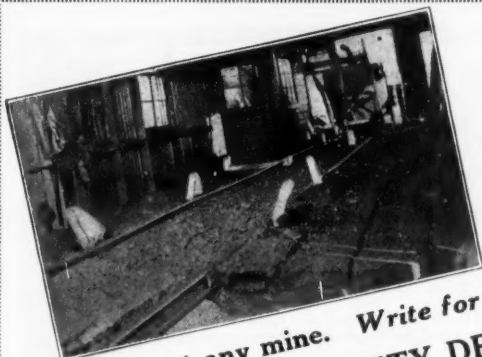
You can depend upon "Cincinnati" equipment to provide safety and facility for your haulage year in and year out at low service cost.

The "CINCINNATI" Frog & Switch Company
Cincinnati, Ohio

Representatives:

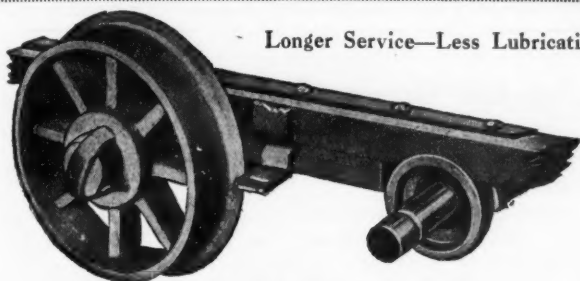
New York: Jno. L. Barry, Jr., 1 Madison Ave.
Charleston: Mr. T. Keith Holmsted.
Chicago: S. W. Lindheimer, First National Bank Bldg.
Pittsburgh: T. H. Edelblute Co., Wabash Bldg.

"CINCINNATI"



A
NOLAN
Saves
Labor

at any mine. Write for data.
THE MINING SAFETY DEVICE CO.
Bowerston, Ohio



Longer Service—Less Lubrication

THE SENSENICH TRUCK

Insures light running and saves power. Made with enclosed hub wheels in which a U-form bent steel pipe is cast to secure lubrication in all positions. There is no chance for oil passageways to become clogged. The wheel is held in place on the axle by a malleable iron lug that fits in a groove. The axle itself is also free to revolve in stationary boxes. Hyatt Roller Bearings can be furnished on request. Write for details.

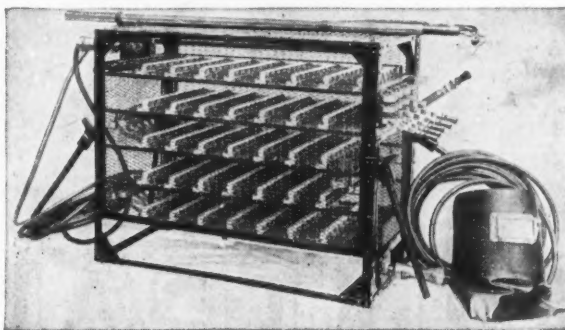
Irwin Foundry & Mine Car Co., Irwin, Pa.

A track-shifting kink

When you shift the track, call the welder. Go over the bonds. Be sure of the welds. Good bonds are purely in the jewelry class unless they are properly welded to the rail. The secret of good welding is a good welder. Here's one that has made good—

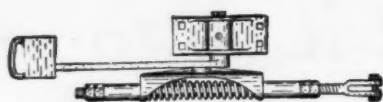
AJAX Electric Arc WELDER

No wonder. It's the only welder of anywhere near its size and price that will always give sufficient amperage for a good weld even where the line voltage drop is 50%. Type IND 300-volt size weighs 55 lbs. and type RWY 600-volt size 150 lbs. Rugged, everything accessible, well ventilated—and inexpensive. You'll like the rest of the story too. It's in the Ajax Bulletin. Want it?



Railway Trackwork Co.

3132-48 East Thompson Street, Philadelphia 219



Switch Stand With Spring
Connecting Rod

You might think it does, but it doesn't

Were you to see a stock of Central Track Equipment—frogs, switches, switch stands, crossings and room turnouts—you'd probably be impressed with the high quality of the various units. Upon examination you'd discover structural and operating features which would impress you tremendously. And you might think that naturally such equipment costs more than the ordinary kind—you might think it does, but it doesn't!

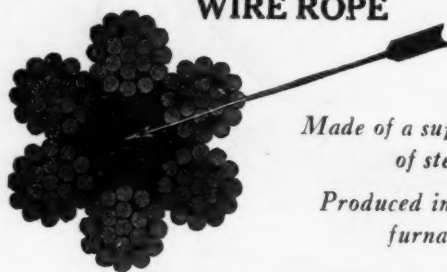
Write for full particulars

**THE CENTRAL
FROG & SWITCH CO.**
CINCINNATI, OHIO

CENTRAL

MINE TRACK EQUIPMENT

BLUE CENTER STEEL WIRE ROPE



Made of a superior grade
of steel.

Produced in our own
furnaces.

John A. Roebling's Sons Company
Trenton, New Jersey

DUNDEE "A" AND "B" FRICTION TAPES



Great Adhesive
Strength
High Quality
Long Life
Priced Right



Write for Samples and Circulars

THE OKONITE CO., Passaic, N. J.
Incorporated 1884

Sales Offices: New York—Atlanta—Pittsburgh—San Francisco.
Agents: Central Electric Co., Chicago, Ill.; Pettingell-Andrews
Co., Boston, Mass.; The F. D. Lawrence Electric Co., Cin-
cinnati, Ohio; Novelty Electric Co., Philadelphia, Pa.
Canadian Representatives: Engineering Materials Limited, Montreal.



STEEL

for Immediate Shipment from Stock

Bars	Pipe	Screen Bars
Shapes	Bolts	Boiler Fittings
Plates	Nuts	Merchant Iron
Sheets	Rivets	Refined Iron
Tubes	Nails	Turnbuckles
Rails	Chain	Wire Rope, etc.

Write for "Journal and Stock List"

JOSEPH T. **RYERSON** & SON INC.

CHICAGO
ST. LOUIS

CINCINNATI
DETROIT

BUFFALO
NEW YORK

Leschen Gravity Tramways

are economical coal carriers. As they take the "air route" irregular ground conditions do not increase cost of installation. They can be operated continuously as they are not affected by weather conditions. Their upkeep is low—but their efficiency is high.

A. Leschen & Sons Rope Co.
St. Louis, Mo.

New York Chicago Denver San Francisco



WHAT AND WHERE TO BUY

A Classified Index of Advertisers in this Issue

For Alphabetical Index See Last Page

- Acetylene Generating Apparatus**
Oxweld Acetylene Co.
- Aerial Tramways**
American Steel & Wire Co.
Interstate Equipment Corp.
Leschen & Sons Rope Co., A.
- Air Aftercoolers**
Ingersoll-Rand Co.
- Air Receivers**
Ingersoll-Rand Co.
- Appraisals**
American Appraisal Co.
- Armature Repair Machinery**
Electric Service Supplies Co.
- Armatures and Field Coils**
Chattanooga Armature Wks.
- Ash Handling Machinery**
Combustion Eng'g Corp.
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Bethlehem Steel Co.
Carnegie Steel Co.
Ryerson & Son, Inc., Jos. T.
- Batteries, Wet and Dry**
National Carbon Co.
- Battery Boxes**
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Hyatt Roller Bearing Co.
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Morse Chain Co.
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Webster Mfg. Co.
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U. S. Rubber Co.
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- Boilers, Water Tube**
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- Brushes, Motor & Generator**
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Link-Belt Co.
- Buckets, Coal Handling**
Link-Belt Co.
- Buckets, Elevator**
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Hendrick Mfg. Co.
Link-Belt Co.
Webster Mfg. Co.
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- Cable, Portable**
U. S. Rubber Co.
- Cableways**
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Lidgerwood Mfg. Co.
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Car-Dumper & Equip. Co.
Mining Safety Device Co.
- Cages**
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Morrow Mfg. Co.
Vulcan Iron Wks
- Carbon Rods & Paste for Welding**
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Link-Belt Co.
Webster Mfg. Co.
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- Car Lubricants**
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- Car Retarders**
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- Car Stops, Automatic**
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Helmick Foundry-Mch. Co.
Koppel Industrial Car & Equip. Co.
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Ottumwa Iron Works
Phillips M. & M. Supply Co.
Sanford-Day Iron Works
Southern Wheel Co.
Treadwell Engineering Co.
Watt Mining Car Wheel Co.
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Ingersoll-Rand Co.
- Cars, Roller Bearing for**
Hyatt Roller Bearing Co.
- Castings**
Falk Corp.
Lobdell Car Wheel Co.
Nuttall Co., R. D.
Sanford-Day Iron Works
Vulcan Iron Works
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- Cement-Gun Work**
Weber Engineering Co.
- Chains**
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Automatic Reclosing Circuit Breaker Co.
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Ohio Brass Co.
Post-Glover Electric Co.
- Clutches, Friction**
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- Coal**
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- Coal & Ash Handling Mchry.**
Jeffrey Mfg. Co.
Link-Belt Co.
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Van Dorn Electric Tool Co.
- Coal Dry Cleaning Plants**
Roberts & Schaefer Co.
- Coal Handling Machinery**
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- Concrete Finishing Tools**
Cement-Gun Co., Inc.
- Condensers**
Ingersoll-Rand Co.
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Automatic Reclosing Circuit Breaker Co.
- Controllers**
General Electric Co.
Goodman Mfg. Co.
Westinghouse E. & M. Co.
- Controllers, Hoist**
Flood City Mfg. Co.
- Conveyors, Chain Flight**
Cross Engineering Co.
Link-Belt Co.
Webster Mfg. Co.
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Fairmont Mining Mchry. Co.
Jeffrey Mfg. Co.
Link-Belt Co.
Marion Mch. F. & S. Co.
Robins Conveying Belt Co.
U. S. Rubber Co.
- Cranes**
Link-Belt Co.
- Cranes, Locomotive**
Link-Belt Co.
- Crossings (See Switches, Frogs and Crossings)**
- Crushers, Coal**
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Jeffrey Mfg. Co.
Link-Belt Co.
Marion Mch. F. & S. Co.
Penn. Crusher Co.
Vulcan Iron Works
Webster Mfg. Co.
- Cutting Apparatus, Oxy Acetylene**
Oxweld Acetylene Co.
- Cutter Lubricants**
Hulburt Oil & Grease Co.
- Dealers' Machinery**
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Bridell Co., Inc. W. C.
Cohen & Son, L.
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Foster Co., L. B.
Frank, M. K.
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Gregory Electric Co.
Hoisting Machinery Co.
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Lindheimer, S. W.
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Morrison & Risman Co.
Myers & Associates, J. N.
Nashville Industrial Corp.
National Steel Rail Co.
Power Mchry. Exchange
Superior Elec. & Mfg. Co.
Zelnicker Supply Co., W. A.
- Decarbonizing Apparatus**
Oxweld Acetylene Co.
- Diamond Core Drill, Contracting**
Diamond Drilling & Exp. Co.
Hoffman Bros.
Punxsutawney D. & C. Co.
Sullivan Machinery Co.
- Dies, Plain & Form Forging**
Little Giant Co.
- Drafting Materials (See Eng. Instruments and Supplies)**
- Driers, Sand**
Electric Service Supplies Co.
- Drills, Air**
Ingersoll-Rand Co.
Sullivan Machinery Co.
- Drills, Core**
Diamond Drilling & Exp. Co.
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- Drills, Power**
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